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ABSTRACT

Presented are the proceedings of a 1976 Engineering Foundation Conference sponsored by the Society of Women Engineers and the Engineering Foundation. The format of the conference consists of an informal program of speakers and discussion group meetings dealing with the effective use, development, and advancement of female talent in handling problems in engineering and management. Topics include Career Patterns, Professional Development, Job Negotiation, Management Success, and Executive Potential. The five appendices contain supplementary information including a conference participant list and a selected bibliography. (MA)

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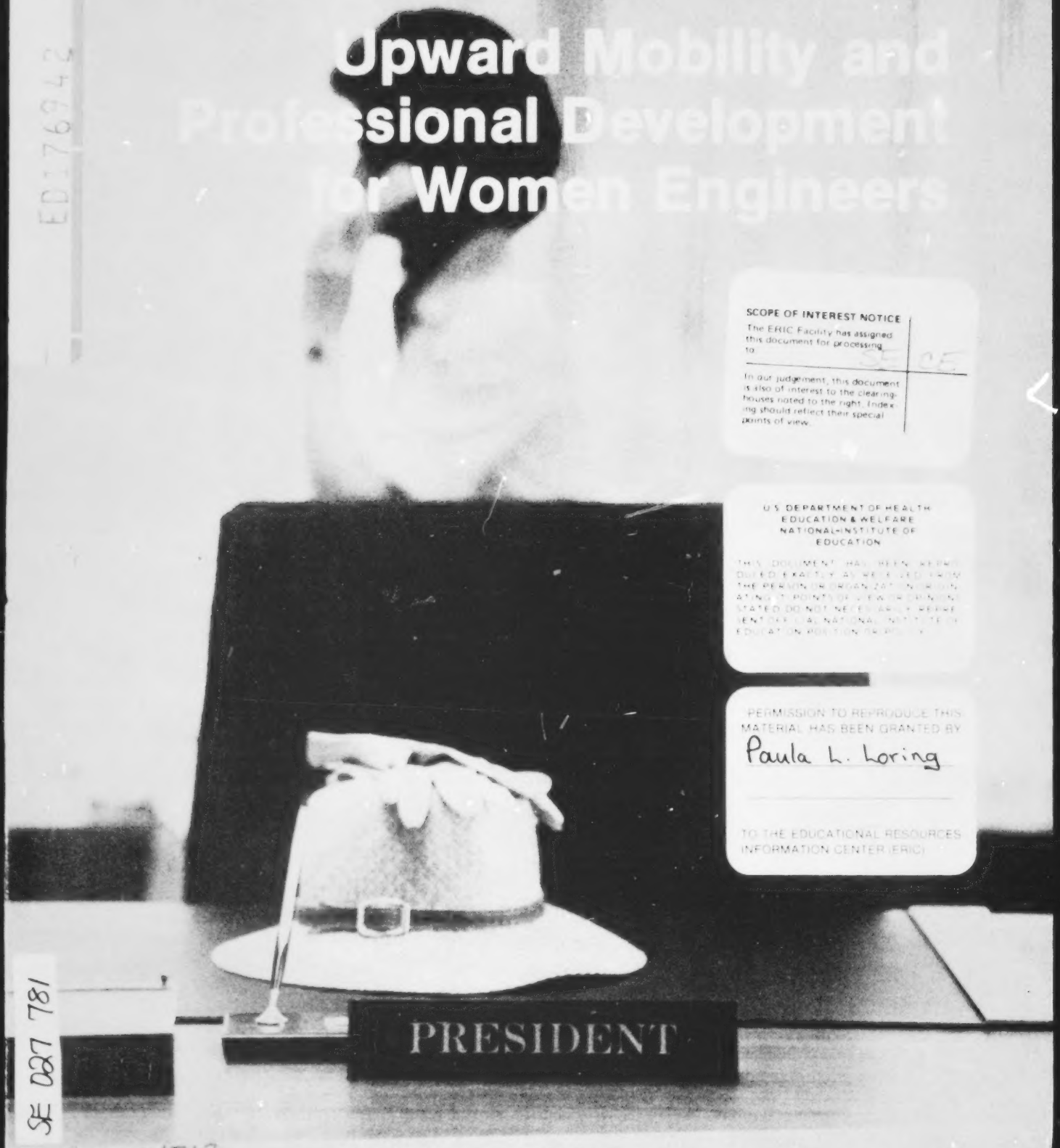

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Upward Mobility and Professional Development for Women Engineers

Conference Chairman and Editor:
LeEarl Ann Bryant, P.E.
Society of Women Engineers

Director, Engineering Foundation Conferences:
Dr. Sandford S. Cole

Proceedings of an Engineering Foundation Conference

Sponsored by the Society of Women Engineers
and the Engineering Foundation

October 11-15, 1976
Tidewater Inn
Easton, Maryland

UPWARD MOBILITY AND PROFESSIONAL DEVELOPMENT FOR WOMEN ENGINEERS

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I. **WOMEN IN ENGINEERING (July 12-16, 1971)**
Conference Co-Chairmen, George Buzliarello and Olive Salembier

II. **WOMEN IN ENGINEERING AND MANAGEMENT (July 16-21, 1972)**
Conference Co-Chairmen, Alfred C. Ingersoll and Olive Salembier

III. **CAREER GUIDANCE for WOMEN ENTERING ENGINEERING (August 19-24, 1973)**
Chairman, Nancy D. Fitzroy

IV. **UP–DATING OF SKILLS AND PREPARING TO RE–ENTER THE ENGINEERING FIELD (August 18-23, 1974)**
Chairman, Elizabeth Lucus Stephens

WESTERN UNION TELEGRAM

WHITE HOUSE OCTOBER 13, 1976

SOCIETY OF WOMEN ENGINEERS, ENGINEERING FORNDATION CONFERENCE
TIDEWATER INN; EASTON, MARYLAND

I SEND WARMEST GREETINGS TO THOSE WHO PARTICIPATE IN THE CONFERENCE CO-SPONSORED BY THE SOCIETY OF WOMEN ENGINEERS AND ENGINEERING FOUNDATION TO DISCUSS "UPWARD MOBILITY AND PROFESSIONAL DEVELOPMENT FOR WOMEN ENGINEERS."

THESE SESSIONS GIVE ME A WELCOME OPPORTUNITY TO COMMEND BOTH YOUR ORGANIZATIONS AND THEIR EFFECTIVE LEADERSHIP ON EXPANDING OPPORTUNITIES FOR WOMEN IN YOUR PROFESSION:

YOUR ACCOMPLISHMENTS ARE THE FINEST INDICATION OF THE WEALTH OF TALENT, ABILITY AND PROFESSIONAL ACCOMPLISHMENT THAT WOMEN BRING TO ENGINEERING. THESE DELIBERATIONS PROMISE TO FURTHER YOUR IMPORTANT EFFORTS TO STIMULATE GREATER INTENT AMONG WOMEN TO PURSUE THIS COURSE OF STUDY AND TO JOIN YOUR RANKS FOR THEIR OWN SELF-FULFILLMENT AND FOR WELL BEING OF OUR SOCIETY.

I HOPE THAT YOUR PARTICIPATION WILL BE A PRODUCTIVE AND REWARDING EXPERIENCE FOR EACH OF YOU.

GERALD R. FORD

INTRODUCTION

The Society of Women Engineers has been pleased to co-sponsor five Engineering Foundation Conferences since 1971 — each focusing national attention on a different aspect of women in engineering. Like ripples caused by dropping a pebble in a brook, the first four conferences continued to excert significant influence and to trigger additional activity long after they were over. Thus these proceedings of the fifth conference are offered as a primer — with a challenge to continue exploration of "Upward Mobility and Professional Development for Women in Engineering."

I sincerely hope that the enthusiasm and excitement of the conference participants is evident in these proceedings. The conference did not consider how women engineers enter the ranks of management. Rather, it picked up where the 1972 Engineering Foundation/SWE conference* left off and addressed the problems of advancing into the highest ranks of technical direction and management — company technical director, corporate vice prisident, etc. The goals are clear, the challenges formidable. Let us begin.

Arminta J. Harness
National President
Society of Women Engineers

* "Women in Engineering and Management", July 16-21, 1972, New England College, Henniker, New Hampshire.

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CONFERENCE OVERVIEW AND RESOLUTIONS

Le Earl A. Bryant, P.E.
Manager, Technical Analysis
Communication Switching Systems
Rockwell International

The "Upward Mobility . . ." conference was structured with formal presentations/discussions in the morning and informal workshops in the evenings. Afternoons were left free of planned activities so that participants would have time for workshop preparation and further less structured interchange of ideas. Supplementing reading material which complimented the workshop topics was distributed to all participants.

The conference participants included men and women who were in various stages of their careers. Experience levels ranged from design engineers who had graduated less than six months prior to the conference to a president and several vice presidents of various sized companies. Even though the experience and position level of the participants varied, the conference maintained concentration on the path from mid-technical/management positions to officer of the company.

The atmosphere and results of the conference can best be summarized by the resolutions which were unanimously approved by participants during the last session of the conference.

CONFERENCE RESOLUTION

IN order to increase the presence and participation of women engineers and scientists in upper level technical and management positions, and in recognition of the facts that:

1. Many of the factors that relate to professional development and upward mobility apply equally to all engineers and scientists.
2. Institutional policy and practice is frequently discriminatory.
3. Institutions and individuals have a shared responsibility for individual career development.
4. Two career ladders for engineers and scientists (technical and managerial) vary in use, acceptance, and visibility.
5. There is a relative absence of women in those management development programs targeted to the highest levels.
6. The achievement of upward mobility by women currently requires significant deviation from social norms.
7. There are women engineers currently qualified and available for entry into high level positions.

WE, the participants of the Conference on "Upward Mobility and Professional Development for Women Engineers", do resolve that:

1. Employers be urged to provide and emphasize equal opportunity for the participation of qualified men and women engineers in technical and management development and upward mobility programs.
2. Employers be urged to take positive action, such as that outlined on page 72, to achieve equity in position power, responsibility, and compensation.
3. Employers be urged to eliminate discriminatory practices such as those outlined on page 70.
4. Employers be urged to recognize and reward qualified women with potential by appointment to high level policy positions.
5. The Society of Women Engineers be urged to study the formulation and implementation of strategic career planning techniques.
6. Individuals be encouraged to recognize and assume responsibility for their own technical and psychological readiness for career advancement.

FURTHERMORE, we the participants of this conference pledge unremitting mutual support for the social changes required to effect these resolutions.

Le Earl A. Bryant, P.E.

Le Earl Bryant obtained her BS in Electrical Engineering from Texas Technological University in 1965 and her MS in Electrical Engineering with a Bio-medical Option from Southern Methodist University and the University of Texas Southwestern Medical School in 1969. She has been employed by Collins Radio/Rockwell International since 1965 when she began work as an electrical design engineer. She has eight and a half years experience as a digital control system engineer and has held positions in sales and marketing research. She is currently manager, technical analysis and planning for Advanced Systems Development in Rockwell International's Collins Communication Switching Systems organization.

Miss Bryant has been recognized as an Outstanding Young Woman of America (1971) and as Texas' Outstanding Young Engineer for 1975. She is active in several organizations, including the Society of Women Engineers and the Texas Society of Professional Engineers.

PURPOSE OF THE CONFERENCE

Dr. Sandford S. Cole
Director
Engineering Foundation Conferences

The Engineering Foundation Conferences were established in 1962 to provide an opportunity for the exploration of problems or issues of concern to engineers from many disciplines. The format of the conferences is designed to encourage discussion of recent developments and to provoke suggestions concerning profitable methods of approach for making progress. This purpose is achieved by an informal program consisting generally of speakers and discussion groups meeting in congenial surroundings remote from the press of daily business.

This type of meeting has proven valuable in disseminating information and generating ideas to an extent that could not be attained through the usual channels of publication or presentation at conventional technical meetings. Attendees from a variety of backgrounds become acquainted and valuable associations are formed that often result in collaboration and cooperative efforts.

The aim of this conference is to extend the frontiers of engineering by fostering a free and informal exchange of ideas and information regarding the problem under consideration.

Since 1971, the Engineering Foundation and the Society of Women Engineers have cosponsored conferences dealing with women in the engineering profession. The 1971 conference on WOMEN IN ENGINEERING dealt with the more traditional approaches of opening employment opportunities for women in engineering and encouraging young women to enter engineering school. The 1972 conference focused specifically on the keys to achievement of executive status for women engineers and managers. In 1974, the conference was concerned with updating of skills and preparing women to reenter the engineering field after temporary retirement.

This conference will deal with the effective use, development and advancement of female talent in handling problems in engineering and management. The advancements that have occurred for women engineers have been significant in the past few years, but opportunities still exist. The background and experience of the speakers for this conference will provide full insight into this subject as well as offer to the participants a full understanding of problems encountered in management and in their professional development.

WELCOME FROM THE SOCIETY OF WOMEN ENGINEERS

Arminta J. Harness
Technical Assistant to the
President, Westinghouse
Hanford Company
President, Society of
Women Engineers

It is my very real pleasure as National President to add my welcome, on behalf of the Society of Women Engineers, to that of Dr. Cole. This is the fifth Engineering Foundation Conference which SWE has been privileged to cosponsor, but the first to be held somewhere other than Henniker, New Hampshire. Don't be surprised then if you hear someone this week refer to this as Henniker V–it's a habit hard to break.

As I look back on these conferences, I am amazed at the progress and change that has taken place in both the Society of Women Engineers and the status of engineers who are women. We are only eight years away from the 100th anniversary of the first enrollment of a woman in a United States engineering curriculum. Eighty seven years after that event, at the time of the first Engineering Foundation/SWE Conference in 1971, the number of women undergraduates enrolled in engineering in the U.S. was still less than 5,000. But as we meet here today, only five years later, that number is estimated to be over 20,000–representing almost 20% of total engineering enrollment.

It was 1893 when Bertha Lamme became the first woman to graduate as an engineer in the United States. Seventy-eight years later, at the time of the 1971 conference, only 0.82% of all engineering undergraduate degrees were granted to women. In 1976 that number stands between 5 and 6%. Even more exciting is the fact that the upward trend is continuing.

That same exponential growth and change can be seen in the Society of Women Engineers. Membership in the Society built very steadily through the 50's and 60's to a total of 1,100 in 1971–with a little over 350 of those being students. Today, approximately 70% of our members are students, and total membership is rapidly approaching 4,500. Regular SWE membership opened to men on June 26th of this year and at that time our Men's Auxiliary was dissolved. Although they still number less than one dozen, we warmly welcome the men who have joined, or have applied to join, to further the objectives of our Society.

Another significant event occurred on June 26, 1976. On that date, following passage of the required bylaws change, four new representatives were seated on our policy determining body–the Council of Section Representatives. These four differ significantly from the other 24 members of the Council in that they represent a previously unrepresented 70% of our total membership–all of the *non-voting* Student Members of SWE. I believe that we are the first to give engineering students a policy-making voice in an engineering society.

As you would expect, an increase from 350 to over 3,000 Student Members in a five year period is having a significant effect within SWE. For one thing, the average age of our members has come back down to about what it was when the Society started.

There were a few "old-timers" in the crowd, but most of the fifty-some women from New York, Boston, Philadelphia and Washington, D.C. who decided in 1950 to form a Society of Women Engineers were recent engineering graduates–turned on to engineering careers by the manpower needs of World War II. Obviously these women were joined through the years by more and more new graduates, but that growth was so slow that the "average" member matured with them. In 1971 the median age of a SWE member was 42. By 1974 it had dropped to 39 but that concealed the fact that the distribution of age was bimodal–the largest group (235) aged 25-29 and a second very large group (14%) aged 45-49. As our older members are starting to retire and more and more of our Student Members are upgrading to regular membership, we are once more becoming an organization of younger women.

With that fact in mind, it is interesting to note that the objectives of the Society of Women Engineers have not changed–they are still as valid today as they were when they were written into the SWE Articles of Incorporation in 1952. Specifically, they are:

- To inform young women, their parents, counselors, and the general public of the qualifications and achievements of women engineers and the opportunities open to them.
- To assist women engineers in readying themselves for a return to active work after temporary retirement.
- To serve as a center of information on women in engineering.
- To encourage women engineers to attain high levels of education and professional achievement.

Yes, the objectives are the same but the emphasis is shifting. There is still a need for our traditional career guidance activities, particularly at the grade school and

junior high levels. There is still a need to encourage women engineering students through subsidized membership and Student Sections. But the growing number of women engineering students makes it obvious that the need is less today than it was a few years ago. For that reason, our activities have gradually started shifting toward the professional development and upward mobility of our members. Thus, this conference.

We are expecting great things from this week. Just as the proceedings from Henniker III became our most valued tool in career guidance activities, so we expect the proceedings from this conference to become our handbook for professional development activities within SWE Sections and Student Sections. It is an exciting prospect and a challenge to each and every one of us here this week.

In effect, we are being challenged to prepare a blueprint for a successful career in engineering. Each of our speakers will, I'm sure, add new dimensions to this blueprint, while the workshops will complete the detail. To help us get started, I would like to conclude by quoting from a speech I was privileged to hear in 1972, when I was still in the Air Force. Brigadier General Daniel James, Jr., then Deputy Assistant Secretary of Air Force Public Affairs, in speaking of his black ghetto youth, said, in part:

> "My young life was filled with advice and encouragement. I was told to eliminate one by one all the reasons some bigot might say I was not capable of standing beside him or deserving of equal opportunity. If he says you are dirty, make sure you are clean. If he says you steal, make sure you don't. If he says you are dumb, make sure you learn. If he says you are scared, make sure you are brave, my son."

And then he added:

> "Let your own contribution to the problems of your race be a by-product of your achievement in your chosen field. You will prosper in proportion to your contribution to the Nation."

And finally he said:

> "Don't stop to argue with the ignoramus on the street who calls you nigger. You don't have time. Press on. Perform. Perform. Excel. Excel. And when you drive back by in the limousine of success, that ignoramus will still be standing there on the corner wrapped in his hate. The power of excellence is overwhelming. It is always in demand and nobody cares about its color."

And I would add: or sex.

Arminta J. Harness

Arminta J. Harness is Technical Assistant to the President, Westinghouse Hanford Company, Richland, Washington. In this position, she is primarily responsible for analyzing the performance, problems and needs of departments within the company, and advising department managers and the President as to any required corrective action.

Born in Oilton, Oklahoma, she graduated from high school in Owensboro, Kentucky. After two years at Lindenwood College for Women, St. Charles, Missouri, she became the second woman aeronautical engineering student enrolled at the University of Southern California, where she received her Bachelor of Engineering degree. Her later education included graduate work in engineering management at the same university as well as numerous technical and system program management courses.

Ms. Harness joined Westinghouse Hanford Company in July 1974 following retirement from military service. As the first woman engineer to join the United States Air Force, she was in the unique position of trail blazer during the 24 years of her military career—rising in rank from Second Lieutenant to Lieutenant Colonel.

Her Air Force assignments included duty as a photographic and weather reconnaissance project engineer, as deputy chief of engineering and then as chief of program control for the target vehicle portion of the Gemini manned space program, and as a research and development director for a national intelligence organization. Her military responsibilities varied from designing intelligence gathering equipment for the U-2 aircraft to providing management direction for the $2 billion Space and Missile Systems Organization budget.

Ms. Harness is a senior life member and is currently serving as the national President of the Society of Women Engineers. She is a member of the Board of Directors of the Mid-Columbia Girl Scout Council, a past president of the Los Angeles Club of Zonta International, a Fellow of the Institute for the Advancement of Engineering and holds many other military and engineering honors and memberships. She enjoys painting, sculpturing, and handicrafts as well as such diverse activities as reading, tennis and flying.

PAST CONFERENCE REVIEW

Olive L. Salembier
Senior Packaging Engineer
Lockheed Missiles and Space Company, Inc.

In 1970 an idea generated by the Chicago Section of the Society of Women Engineers led to the planning of the first conference on WOMEN IN ENGINEERING sponsored by the Engineering Foundation Conferences and co-sponsored by the Society of Women Engineers. In July 1971 a conference entitled "Women in Engineering–Bridging the Gap between Society and Technology" was held at New England College, Henniker, New Hampshire.

I had the pleasure of co-chairing this week-long meeting, which concerned itself with the extent to which a greater participation of women in technology can arrest the widening gap developing between technology and society and with the proposal of a national strategy for increasing this participation.

Invited speakers presented background material and answered questions on relative subjects, and the attendees contributed to workshops which considered the opportunities for women engineers and their effective participation in industry, education and government. The myths and prejudices which have in the past diminished the opportunities for management training and career progress for women were examined and exploded. Participating women engineers provided personal disproof of such standard myths as:

1. To be successful in engineering it is necessary to be physically rugged and mechanically able. Intellectual ability and analytical minds are much more important.

2. Engineering is too difficult for women. This myth dissolved in the light of the accomplishments of many outstanding women engineers, with particular reference to those who have been chosen to receive the SWE Achievement Award since 1952.

3. Woman's place is in the home, and the charge that women do not take their careers seriously and only work for extra money dissipated in the face of living proof to the contrary.

Speakers from industry stressed the mounting problems of society which are technological in nature and the need more and better engineers and technicians as a vital human resource in solving these problems. It was predicted that in 1989 fifty percent more engineers will be needed than in the peak year of 1968. Industry admitted awareness of the facts that women are under-employed, under-utilized, and generally have been excluded from job classes where they are needed.

Legal requirements for affirmative action programs and equal employment opportunities have brought to the attention of industry the necessity for establishing firm policies, with the solid backing of top management, on the employment and advancement of women. To accomplish a proper relationship, it is essential that a communications bridge be built which will include participation of not only women, but society and institutions, to provide the background for a workable and profitable solution for all.

The role of Industry-Education Councils in motivating young people to reach their full potential was detailed, and the importance of reaching students on a person-to-person basis at an early age was stressed. In encouraging young people to enter the field of engineering, contact should be made at the grade school level. Particularly in this area, women engineers are most valuable as role models. Most boys and girls have never seen a woman engineer, and it was suggested that on Career Day a woman engineer be present to demonstrate to both boys and girls that engineering is not all brawn, and that engineers can not be easily identified only by their hard hats.

Speakers on the Guidance Approach also felt that there is no reason why the challenge of an engineering education should not be as stimulating to a girl as it is to a boy. A strong appeal was made to the conference attendees to help in providing correct information about careers in engineering, particularly in creating a more realistic image of the woman engineer. Of prime importance is the eradication of the concept that engineering is an unfeminine profession which is not compatible with marriage and a family. It was stressed that it is necessary for women engineers, by their own example, to convince the public that technology in today's world is just as much a woman's concern as it is a man's.

1972 CONFERENCE–WOMEN IN ENGINEERING AND MANAGEMENT

As a result of the unanimous recommendation of the first conference, the Engineering Foundation and the Society of Women Engineers sponsored a second conference on WOMEN IN ENGINEERING. Again I was privileged to co-chair the program held in July 1972 at New England College in Henniker, New Hampshire. With an increase of 40% in registrations representing management, education, government and industry, it was interesting that over 70% of those attending held engineering credentials, regardless of their current positions.

Theme

The 1972 Conference addressed itself to the most cogent of the questions raised in the previous conference: "Once

women engineers are accepted in the engineering profession, how do they get promoted to positions of management, with greater responsibilities, prestige and income?"

With the theme "Women in Engineering and Management", the sub-theme of "Keys to the Executive Powder Room" developed, and four keys were selected for study as basic elements of success in engineering management for women:

1. KNOW THE TERRITORY

2. KNOW THYSELF

3. KNOW THE LAW

4. KNOW YOUR STUFF

It was agreed that while women engineers have reached management positions of responsibility and prestige in some cases, the number so recognized is still miniscule. Opportunities for promotion are growing due to Affirmative Action Programs, and women engineers must prepare themselves to take such openings.

Dr. Alfred C. Ingersoll, co-chairman of the conference, pointed out that years of effort have gone to persuading high school counselors, teachers and parents that engineering makes a fine career for girls, based on excellent entry-level job opportunities and salaries, but still only one per cent of the engineering work force in 1971 was female. Until recently, advancement to positions of responsibility, prestige and higher salary has been more of a dream than a reality for women engineers. Affirmative Action Programs, under way in every major organization employing engineers, are requiring employers to balance their management rosters with proportional representation of women and racial minorities. As a result, companies are currently looking for management material among women engineers and the environment for promotion upward has improved considerably.

Keynoter Merritt A. Williamson, Distinguished Professor of Management at Vanderbilt University, pointed out that the progress of women engineers moving into management over the past thirty years has been dismal compared with that of men. He quoted statistics to prove that gross inequities exist in today's career environment for women, both in opportunities for advancement and in the gap between the earnings of the sexes. The ambitious woman engineer seeking promotion will face the fact that the rules governing the environment in management are set by men; and in order to obtain results, she will play the game by the existing rules while developing her own management style.

KEYS TO THE EXECUTIVE POWDER ROOM

Key No. 1 - Know The Territory

Speakers from government, industry and education spoke of knowledge of the territory in the field of management in relation to the characteristics that determine whether an individual has what it takes for promotion to higher responsibilities. Requirements of top management seeking engineering management candidates were outlined, and women engineers related their own experiences in assessing these requirements and in working for promotion.

Alfred J. Gardner, Assistant to the President, Lockheed Missiles and Space Company, described "How it has been - How it is - and How it is going to be" in relation to women engineers in management. He pointed out that the ideology which provides the basis for discrimination against women has become a non-conscious thing which makes it difficult to identify and counteract, since men are often not actually aware that it exists. He categorized the type of industry discrimination which faces women engineers seeking management positions as covert, overt, and institutional. To combat the problem, the woman engineer must display technical competence, coupled with a good basic education and continuous upgrading of her skills as technology evolves. Mr. Gardner pointed out that in order to move into management a woman engineer must demonstrate supervisory capacity, problem-solving ability and good judgement. Much of the bias will be eliminated by the successful performance of an increasing number of women who are becoming managers. Public awareness of the changing status of women and the affirmative action programs will also automatically provide some relief from past biased viewpoints. The forcing function of greatest significance, in Mr. Gardner's opinion, is an amendment to Chapter 60 of Title 41 of the Code of Federal Regulations. Chapter 60 deals with the Office of Federal Contract Compliance, Equal Employment Opportunity, Department of Labor. Amendment 60-2 is Affirmative Action Programs, officially referred to as Revised Order No. 4, which is a part of the contractual commitments under each and every governmental contract. It is a powerful tool in the fight to end discrimination against minorities and women. Such forcing factors, together with the ever-increasing streams of antidiscrimination sentiments and actions will break down many of the difficult barriers which have previously faced women who aspire to upward movement in their careers.

Workshop - Key No. 1

Four workshops were held concurrently during the Conference and every attendee participated in every workshop. The recommendations and conclusions of each workshop was a composite of the input of all participants.

Results of the workshop on KNOW THE TERRITORY indicated that two-way communication is an essential in assisting women to reach levels of increased responsibility. It is presumed by men that women are not interested in management, and women need to be encouraged to express their career goals specifically and directly to their supervisors.

It was emphasized that company policy should include the education of male managers to accept women into their ranks and to work with them on an equal basis. In striving

for recognition, women must develop management skills and avoid being relegated to "assistant" status at any level. If there are no prospects for direct upward mobility in her present position, the woman engineer should be prepared to move laterally, within a reasonable limit, in order to move upward. Women must be reminded that doors to administrative responsibility are no longer closed to them and they should be encouraged to explore all options open to them in attaining their goals.

Key No. 2—Know Thyself

The segment on KNOW THYSELF detailed some of the psychological and sociological factors that provide powerful influences on motivation toward advancement. Personal goals, ambitions, fulfillment and frustrations were considered.

Dr. Nola Stark, Dean of Students, Life Studies, University of California, Los Angeles, presented an in-depth study of the importance of facing real facts and looking inward in taking an inventory of personal assets and liabilities.

Workshop—Key No. 2

The workshop on KNOW THYSELF developed a list of personal attributes desirable for women who wish to succeed in management. It was concluded that these attributes were approximately the same as those which make a successful male manager. Some of the most important of these were considered to be:

1. The aspiring manager must set her goals early, work hard to achieve them and accept full responsibility for her actions.

2. A woman should rely upon her competence for success and not on feminine ploys.

3. A sense of humor is essential in meeting frustrations.

4. A woman should always be in control of her emotions and not let them control her.

5. It is essential, in all human relations, to leave the other person with intact dignity.

6. A woman should treat others as though they were working with her, not for her.

7. She must be willing to allow others to do their own work without interference, making herself available to give direction only when sought.

8. She should know how to interact with others.

9. Because a woman's role has traditionally been a subservient one, to succeed in management she may have to learn assertiveness.

10. She must be prepared for disappointments, disillusionment and the failure to achieve impossible dreams.

11. A woman must learn to accept praise and commendation without either emphasizing or belittling her own accomplishments.

Resolutions resulting from this workshop committed the participants to a program of action, including:

1. Encouraging all employers of women engineers to hold special discussion groups and awareness sessions designed to promote greater understanding between men and women engineers and managers.

2. Insuring equal participation of qualified men and women engineers in management seminars and organizational development programs.

3. Encouraging technical and professional societies to provide guidance on such matters as personal goals, ambition, fulfillment and job frustrations as part of their guidance programs with college engineering students.

4. Encouraging technical and professional societies to consider a special membership category for husbands and wives.

5. Urging all employers who promote engineering personnel by moving them from one geographical location to another, to accept responsibility for insuring re-employment at the new location for the working spouse.

6. Urging all engineering educational institutions to encourage and counsel women engineering students to join, and actively participate in, student chapters of professional and technical societies as a demonstrated means of gaining experience in working with men.

Key No. 3—Know The Law

KNOW THE LAW sessions highlighted representatives from government who reported on the details of legal rights for women and the new laws which have been passed and are evolving to protect the rights of women in employment, guaranteeing reasonable advancement on a par with men.

Honorable Jacqueline Gutwillig, Chairman of the Citizens' Advisory Council on the Status of Women stated that the basic position of the Council is that women must be treated as equals, as individuals, and as people.

Much of the negative behavior on the part of business and education has been unconscious and based on unexamined assumptions about the proper role of women and men, she felt. Ways must be found to correct the manner in which women have been unequally treated in work and class room

situations. The speaker expressed the hope that in business the difficulties of this transition will be approached with good will and good sense. In education, the transition should be easier due to the humanistic philosophy of educators and their desire to prepare students for the world of work and society. Mrs. Gutwillig discussed in detail the provisions of the Equal Rights Amendment, Affirmative Action Programs, and Sex Discrimination Guidelines used in developing a written Affirmative Action Program for the utilization of minorities and women.

Workshop - Key No. 3

The workshop on KNOW THE LAW concluded that the woman engineer, having discovered her legal rights, her available means of recourse, and the procedures required to initiate a formal complaint, may still be concerned about reprisals. It was agreed that reprisals are often dependent upon the manner of presentation of the grievance, and the situation varies markedly between large universities/corporations and small colleges/businesses, as well as between the lumbering bureaucracy of Federal Government and the smaller municipalities.

The problem of the employers who need help in order to meet the requirements of their Affirmative Action Programs was dealt with, and it was suggested that an information data bank be considered to aid employers in locating qualified women and to defeat the non-compliance defense subterfuge of not being able to locate qualified applicants.

In handling the common problem of hiding sex discrimination under other reasons for rejecting an applicant for promotion, women engineers should be encouraged to question and probe for details on what qualities are lacking and what areas need improvement or development. This questioning may bring to the attention of the employer the fact that the real objection is the sex of the applicant.

Recognition was given to the fact that although courses of action are best followed without legislation, they often cannot be initiated without the initial impetus of law.

Key No. 4 - Know Your Stuff

The program concerned with technical competence led to the conclusion that continuing education is the most important key of all, since it enables women engineers to keep up with the latest advances in technical fields and at the same time allows for study of the rudiments of the law, psychology and management.

Speakers on this topic pointed out that continuing education is a many faceted process that is presently in a state of rapid and exciting change, providing greater flexibility and increased opportunity for women facing the problem of re-entry into the job market; seeking advanced degrees in their fields; avoiding technical obsolescence; or shifting their focus from engineering to management.

The changing factors within the engineering profession and the emerging role of the engineering technician and/or technologist in relation to accreditation and registration were explored.

The questions of the possible need to emphasize collective bargaining as a means of protecting the employment status of engineers and the built-in deterrent towards the growth of collective bargaining with the rise of many engineers to management status were discussed.

The importance of technical societies in bringing about changes was stressed and women were urged to become actively involved and rise to positions of leadership and responsibility in technical societies.

It was pointed out that there will be severe stress in engineering practice in the years ahead and only those with educational preparation will be able to contribute fully to the future society. The most effective way of obtaining the required education, for men and women alike, will be in capsules of continuing education, short courses, conferences and in-plant courses taken by working engineers without having to give up their jobs to return to school on a full time basis. Women should make it clear to their management that they should have the same opportunities to participate as do their male peers.

Workshop - Key No. 4

The workshop deliberations on KNOW YOUR STUFF recognized that in-service engineers must constantly reassess their current competence and be willing to re-train to maintain progressional growth. Engineers should be aware that usually the first supervisory role is a testing ground for management. Once management responsibilities are accepted, additional growth in areas other than the purely technical is required and the engineer must broaden his or her perspective into interacting areas.

It was agreed that employing organizations should provide opportunities for job sharing for women engineers, with adequate fringe benefits and compensation. They should also assume responsibility in the career development and professional growth of their employees by providing continuing education programs and encouraging the updating of technical skills.

Emphasis was placed on the particular importance of women taking leadership roles in the technical societies, thereby assuming responsibility for the direction that the engineering profession will follow. This effort should start in college through active participation in student chapters of technical groups; preparation for the Engineer-In-Training examination; and continuance through registration as Professional Engineer, or Certification in the chosen engineering field.

SPECIAL FEATURES

Student Participation

Three women engineering students who presented their viewpoints to the Conference considered that engineering as a career is often not taken seriously by many talented girls because they have had very little exposure to the nature of an engineering career. To remedy this situation, they felt, it is necessary to provide career guidance not later than at the high school level. Engineering colleges should attempt to encourage young women students by inviting active women engineers as guest lecturers; hiring qualified women faculty; and aiding in the organization of on-campus student sections of the Society of Women Engineers. Job opportunities and recruiting interviews for women in engineering should be emphasized and additional publicity should be given to continuing education programs, particularly those which will permit women in temporary retirement to maintain a high degree of technical knowledge which will permit them to reassume their engineering responsibilities at the same level.

Industrial Panel

A panel from industry discussed the outlook for women in engineering and the views of industry, eliciting spirited participation by the conferees.

It was commented that those women who do choose engineering as a profession are usually more serious about their goals than the women who study in general business or liberal arts. The responsibility of industry to participate in career planning for women and to take positive action in overcoming the lack of vocational guidance for women in engineering were stressed, as was the problem of part time work and the re-establishment of interrupted careers.

Areas considered were Affirmative Action Programs, co-op jobs, career counselling programs, recruiting programs and discrimination. In discussing job interviews, the danger to the woman applicant of appearing over-aggressive; the importance of being feminine; the necessity of expressing willingness to get involved and work with people at all levels; and the ability to cope with disappointments and failures received considerable emphasis.

CONCLUSIONS

The first two conferences on Women in Engineering demonstrated that women engineers can accomplish the same tasks as men engineers and that they are eager to accept their responsibilities on the basis of equality and proven ability.

With diminishing concern for discrimination and prejudice, women can move toward goals of the fullest development of their potential as individuals and toward full participation in society. Women engineers must continue to cultivate the desire to contribute inventiveness and imaginativeness to their work; educate themselves on a continuing basis; and search out sources of knowledge and skill needed to move firmly in the direction of achievement, while wholeheartedly shouldering their responsibilities on an equal basis.

A common thread through the deliberations of the Conferences was the awareness of the importance of the participation of practicing women engineers and managers as role models. Personally, I would like to urge those of you present at this Conference who have not had the experience of sharing your successes and failures with students and with other women engineers, to do so at every opportunity. Often is is not easy. Your employer may not be willing to support you in this effort, or your male engineering colleagues may suggest that your actions are self-seeking. Being a role model demands considerable personal time and effort and sometimes considerable expense. But you will find the rewards to be commensurate. If we do our job conscientiously, we may well be the last generation of working women engineers and managers who find it necessary to tell our personal stories in order to ease the path for women now beginning on the upward mobility road. There is no question that in the past ten years more new opportunities for women have opened than in all the previous years of the twentieth century. The momentum which is building to insure increasingly rapid upward opportunities would indicate that in the 1980s our goals will have been transformed to reality.

When that day comes, I will enjoy, with heartfelt gratitude, following the record of achievements and contributions of many of the young women in this audience today.

Olive L. Salembier

Olive L. Salembier, a past national president of the Society of Women Engineers, is Senior Transportation and Packaging Engineer for Lockheed Missiles and Space Company of Sunnyvale, California.

She is the first woman member of the American Management Association Packaging Council and is Chairman of the Certification Examination Committee of the Society of Packaging and Handling Engineers. Educated in Commerce and Education at the University of Victoria, British Columbia, she later turned to packaging engineering and is a Certified Professional in Packaging and Materials Handling. She was the first woman to be honored as a prize winner in the National Packaging Competition of the Society of Packaging and Handling Engineers. In 1961 she won First Place Award in Corrugated Packaging and in 1965 won another national award in Military Packaging.

Ms. Salembier has taught extension courses and participated in seminars and short courses for UCLA, California State College, Arizona State University and the Society of Packaging and Handling Engineers. She was the first woman to be elected to Sigma Pi Epsilon, honorary packaging fraternity and has been cited upon numerous occasions for her contributions to the engineering profession.

CAREER PATTERNS: DECISION-MAKING UNDER CONSTRAINTS

Esther Lee Burks
Terry Connolly
Jean Li Rogers
Georgia Institute of Technology

The research reported here* addresses the problem of the under-representation of women as professionals in science and engineering. Specifically, it aims to delineate and assess the factors operating on established women professionals in these fields which cause them to leave, or not to re-enter, their professional careers. The study focuses on the 'transition decision' of the established woman, with a view to identifying the variables which, if modified by policy actions of employing organizations, the federal government, or the universities, could increase the probability of full mature involvement of women in these professions.

The major empirical thrust of the research is based on analyses of over 1000 responses to a questionnaire mailed to women sampled from professional society mailing lists in engineering, statistics, and the life and physical sciences. The questionnaire addressed a range of issues connected with the respondent's personal background, education, and work experiences, and with various measures of personal needs, satisfactions, and attitudes associated with work roles and other roles such as child-rearing. In addition, several issues connected with perceptions of work-related discrimination against women, and of difficulties faced in pursuing full career involvement, were included.

1. MAJOR FINDINGS

We should, at the outset, reiterate the scope and limitations of the sample of respondents from whom these responses were gathered. They are, we believe, broadly representative of currently-active women members of professional societies in a range of scientific and engineering areas. They are not, of course, representative of women in general, of working women in general, or of professionals in general. They are, then, a highly select group of women, the survivors of the lengthy process of screens and filters which, particularly for women, represents the path to professional maturity. This 'successful survivor' image needs to be kept clearly in mind in attempting to understand these data and their implications.

A first question is: to what extent has professional survival been associated with a shift away from the traditional values and satisfactions of wife and mother roles? Broadly, our data suggest such a shift, but not on any wholesale scale, and less dramatically for our younger than for our older respondents.

Most have married and borne children, though on both measures, the proportions who have not (29% never married; 54% of those marrying have borne no children) are substantially larger than for the population as a whole. Most reject the suggestion that women who want a career should not have children, or that a woman's career should be secondary either to her husband's career, or to her own roles as wife and mother.

Professional commitment is, predictably, very high for these respondents. Of those who have taken a career break, either by necessity or preference, most have quickly returned, attracted primarily by the intellectual and intrinsic rewards of professional work. Salient personal values are predominantly professional, and professional work is clearly seen as the most effective means to their attainment. Work satisfaction is generally high.

The material rewards of these careers are substantial, though by no means spectacular in comparison with similarly-qualified men. Well over half of our respondents with full-time jobs report earnings in excess of $15,000 per year; almost a third report in excess of $20,000 per year. Income advances with age, with academic qualification, and with supervisory responsibilities. Managerial employment, and employment by federal or state government, is generally better remunerated than is work in other areas, or for other employers. Markedly lower earnings were reported by respondents in heavily-female work environments. Little overall sex-related discrimination was seen in the area of salaries. Income is positively related to job satisfaction, and negatively related to propensity to engage in job search.

Career breaks are less common and less disruptive for this sample than might be expected. Well under half of our respondents have taken a break of six months or more since starting professional work, and very few have taken more than one. The most common reason for taking a break is pregnancy (not, it should be noted, getting married), though a startling 36% of women who have borne children have not taken even so brief a break. Other commonly-cited reasons for a break include returning to college, and geographical moves, often associated with husband moving. The median length of break was two years, with rather longer durations if the break was pregnancy-related. Almost three quarters of those who have taken breaks have returned to professional work, with a further 9% currently trying to do so. A significant number of respondents take advantage of part-time work opportunities either as an alternative to a complete break, or as a transition back into full-time work. Finding adequate child care is the major

* *(NSF Grant GY-11317 to Terry Connolly)*

problem for women returning to work after leaving for family-related reasons, while finding a suitable job in the major difficulty for those taking a break for other reasons.

Rather low levels of sex-related discrimination are reported in most job-related areas. Most discrimination is seen in areas of promotions and preparation for top-level careers, least in work assignments, formal recognition, and access to the grapevine. For these women, negative career impact is seen less from on-the-job discrimination than from off-the-job problems child rearing and family responsibilities, demands of husband's career, and finding suitable job opportunities.

2. POSSIBLE POLICY IMPLICATIONS

Note: The proposals in this section were much enriched by discussions which took place at a conference of governmental and employing organizations held at the Georgia Institute of Technology in August 1975. We would like to express our gratitude to the participants in that conference.)

Perhaps the most significant implication of these data is a very broad and general one: that it is possible for a woman to attain, and to succeed in, a full-scale professional role in science and engineering, and to reap the rewards thereof, without foregoing marriage, childbearing, and other fulfillments of normal adult life. Most of our respondents have married and borne children. At the same time, most work full-time in professional jobs, find their work satisfying, are highly committed to their careers, do not see extensive sex-related discrimination on the job, take few or no breaks and after a break quickly return to professional practice. Their work is a major interest in their lives, and the primary means to satisfying important values. At the same time, they do not reject the traditional values of home and family, seeking instead to share these roles with their husbands. In short, these women vividly contradict what might be called the "professional woman as freak" stereotype. While their careers are centrally important to them, they have not been bought at the price of embittered, lonely spinsterhood; they have been built into a balanced and rewarding life.

The fact that such a life adjustment is possible should not, of course, be taken to suggest that a fulfilling professional life is readily available to women in science and engineering. Recall, again, that our sample represents survivors of an extensive screening and attrition process which, on the evidence cited in our introduction, operates with differential sharpness against women. Even within this elite group of survivors, there is evidence of a number of factors which militate against career involvement, and which are accessible to policy intervention by either individual employers or governmental action. The more salient of these factors are:

a. Salary Differentials

The present data support the familiar finding that women employed in areas with predominantly female labor forces earn markedly less than do similarly-qualified women in male-dominated areas. The phenomenon and its consequences are well known, and we have little to add to the debate. We note only that our data are consistent with earlier findings that poor pay is associated with high turnover (costly for the individual employer), and may lead to career abandonment (with larger costs both societally and personally). The combination of legal action and labor market pressures appears to be reducing these salary differentials in many areas. Our data indicate that their removal would be beneficial.

b. Career Development

While little overall job discrimination was reported by our sample, two areas of concern emerged: promotions, and preparation for top-level positions. There is a suggestion here that, while substantial equality of treatment may have been achieved at the entry and intermediate professional levels, employers are not yet ready to give full support for a woman aiming for the highest levels of her profession. The long-term depressing effect of exclusion from top positions on entry to and persistence in professional work need not be emphasized.

Our data clearly indicate that familiar rationalizations based on women as short-term, low-commitment, and unreliable employees are untenable, at least for this elite group. Their values, commitments, and aspirations are fully those of the serious professional. Employers who wish to retain such talent must be prepared to make available to them the full range of professional rewards. Specifically, attention should be given to the career development mechanisms routinely available to high-achieving men career counseling, job rotation, and, more subtly the development of the mentor-mentee (or 'godfather') relationships frequently identified as critical to upward career mobility.

c. Dual Careers

Not surprisingly, most of the married women in our sample have highly qualified husbands, most of whom are, we assume, heavily involved in professional careers. Most endorse attitudes supportive of such dual careers with a rather egalitarian sharing of household and childrearing activities. However, a number of employment practices associated with marriages based on only one career appear disruptive of dual-career arrangements. Geographical moves,

often associated with demands of husband's career led to career interruptions for a significant number of our respondents. Such moves led to difficulty in finding suitable employment, a difficulty no doubt exacerbated by potential employers' suspicions that the job would last no longer than the husband's next posting. Cooperation on the part of employers in managing dual husband-wife careers seems urgently called for. For example, it may well be that a careful reassessment of the necessity for frequent geographical moves is in order (for both men and women); it may be possible to provide the required variety of experience without such frequent moves. A second possibility is the reevaluation of company policies regarding employment of married couples ("nepotism rules"), since planning of moves would presumably be more feasible when both husband and wife are employed by the same organization. Where this is not possible, it would be useful for the organization precipitating the move to work with both employees in obtaining suitable employment for both, perhaps with the aid of formal or informal employment opportunity pools set up in cooperation with other employing organizations in an area. (It might be noted that academic employers frequently provide such assistance in attempting to recruit a promising candidate.) At the very least, employers will have to confront the fact that many of their most promising professional employees are involved not only in their own careers but also those of their spouses, and that the development of one to the detriment of the other is likely to be resisted, with significant costs both to the individual and to the organization. Given understanding and acceptance of dual-career family structures, supportive mechanisms and practices will no doubt emerge on both an *ad hoc* and a routine basis.

d. Child-Rearing

Child-birth and child-rearing is a major source of career difficulty for our respondents. We are not, on these data, able to conclude whether the rather high percentage of married respondents who have not borne children reflects personal preference or a perception that motherhood and career are incompatible. Most respondents disagreed with a statement that the two are incompatible, suggesting preference as the predominant mechanism. However, pregnancy and family time needs show clearly as the most common causal factors in career breaks; for pregnancy-related breaks, finding adequate child care was the most critical problem in returning to employment; and having small children at home was rated as having had the largest overall impact on career involvement on those affected.

There appear to be a number of directions in which policy intervention could support and extend our respondents' efforts to manage these problems. We note, first, that our respondents generally endorse an egalitarian division of child-rearing and housekeeping duties. One possibility, then, is for employing organizations to support this pattern by treating child-birth and infant care as a *family*, rather than as a *woman's* matter. The availability of "paternity leave", and of part-time work opportunities for both partners seems to flow naturally from such an understanding, as does the idea that absence from work to care for sick children is as legitimate for a father as it is for a mother. Establishing the informal social acceptance and legitimacy of such practices would appear as important as the administrative mechanics of their implementation.

Non-availability of adequate day-care facilities emerged in our data as a serious source of difficulty for women wishing to return to work after a break. Given the brevity of the breaks frequently reported for child-bearing, the need here would seem to be for day care from quite early ages up to (and perhaps past) school entry age. It would appear valuable to explore a number of possible means for providing such facilities - for example, the relative merits of in-plant, commercial-for-profit, school-system-based, or directly-government-operated schemes, and the methods of financing each. We pretend no expertise in such matters, noting only that our data suggest a significant unsatisfied demand for day-care services, and (given the characteristics of our sample) services of high quality.

A final area relating to child-rearing patterns in this sample is the frequent use of part-time employment, when available, after pregnancy-related career breaks, apparently as a means of phasing back into full career roles. Again, an understanding by employers of the life patterns of married professional women would seem the only prerequisite to a variety of supportive activities, matching the needs of the employee with the needs of the employing organization. Possibilities include job pairing with two employees splitting one job assignment; scheduling of work hours around school hours, so that one parent can be at home until the children leave for school, the other when they return; arranging work-related travel needs in light of family needs, school vacations, and so on. Experience with various flexible work arrangements suggests that such variations on the usual five eight-hour-day pattern can be accomplished with little disruption, and to the benefit of both organization and employees.

In summary, we have suggested a number of areas in which the findings of this study lead fairly directly to possible policy interventions which would facilitate entry, retention, or re-entry of professional women into full professional roles. At the broadest level, it appears important that wide dissemination be given to our finding that full professional roles are possible for women in science and engineering fields without demanding sacrifice of traditional roles of wife and mother. Getting this information to students and career counselors at high school and college levels may be of value in destroying negative stereotypes, thus encouraging entry into these professional areas in the long run.

More specifically, we have identified a number of factors which are presently associated with reduced professional involvement for women now in these professions, and have

suggested several possible action alternatives which might help ameliorate these difficulties. In our view, the specific content of these suggestions is less important than a clear understanding of the problems they address and a firm commitment by both employers and government to devise solutions.

A final note: while it is our conviction that a compelling case can be made for the provision of genuine equal employment opportunity for professional women as a matter of basic social justice, we have avoided such arguments here. Instead, as we have argued elsewhere, we see rapid and wide-spread change in this area as more plausibly flowing from the combination of legal pressure and a growing shortage of qualified people in scientific and engineering disciplines. In this light, we would expect employing organizations to implement mechanisms such as those proposed above less from motives of high-mindedness than those of clear self-interest. Given the growing need to hire and retain highly-qualified women professionals, we would hope that our findings will help to provide a factual basis from which appropriate mechanisms can be devised and implemented.

It is our belief that the provision of genuinely equal employment opportunity to women is an important national goal, and that the present research provides several clear suggestions as to how this might be brought about in at least one area, that of professional work in science and engineering. Our ultimate satisfaction from this research will come less from the extension of understanding which we believe we have achieved than from seeing these understandings impact social policies, and in turn the working lives of individuals.

Esther Lee Burks

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Prior to her present assignment, she served as an instructor in the Industrial and Systems Engineering Dept. and assistant to the Dean of Engineering, Georgia Institute of Technology. She has developed and managed successful programs for women in engineering, participated in a National Science Foundation study on key career decisions of women engineers and scientists, and has presented/published several papers on women in engineering. Ms. Burks is active in the American Society for Engineering Education, American Institute of Industrial Engineers, and the Society of Women Engineers.

WHO IS GOING WHERE?

Dr. Alva T. Matthews, P.E.
Consultant, Wiedlinger Assoc.

There has been a revolution for women, and we are living in it. Sometimes quiet, sometimes noisy. A few women are not even aware of it. Most women have had their thinking profoundly changed by it. This revolution has brought women to the point of recognizing and considering more options for their lives than ever before. The changes for women entering the engineering profession have been among the most dramatic of all.

Given the broadening of life patterns and career options, women are still faced with the reality of very limited paths to high accomplishment, recognition, money and power. In other words "to the top." There are so few women at the top in any of the professions or in business, that expectations for change in this situation are higher than ever before.

I am reminded of the statistics that Dr. Parrish of the University of Illinois showed at the Henniker III Conference. He showed a set of graphs with numbers of women entering professional schools plotted against years. The curves were very flat up to 1970. After that the curves began to rise exponentially up to the last figures, which were for 1974. If we allow for four years of training in the professional schools, that exponential rise in numbers of women in the professions themselves should be quite noticeable by, say 1976 to 1978. And by the force of numbers alone, the pressure for women to move upward in the business and professional worlds should be greater than ever.

The previous Engineering Foundation Conferences have been very timely in treating the problems of women in engineering. These Conferences have provided a means for concentrated exchange of ideas that helped to build the wave of change that has not yet crested in the engineering profession. We can expect that the momentum which seems to be building for more women to move to the top will be aided by the present Conference; that problems inhibiting upward mobility will be faced; ideas for overcoming the problems will be shared; and, realistic expectations for change will be adopted.

Upward mobility implies the movement toward success. By success we mean money, social position, public recognition, peer recognition, power, influence, authority. Each of these is hard to define by itself, but any one, or combination of them will be present in a successful career. Ideally, of course, success should be measured in degrees of satisfaction for the individual. But personal satisfaction is usually augmented by one or more of the above qualities for what the world measures as success.

Success in the business or professional world usually is measured in the size of your take-home pay and the size of your sphere of influence (that influence being either in the form of authority or power). I don't think that we should lose sight of the fact that success has some other forms. For instance, success for a woman with a family may be the achievement, and then the maintenance of a multi-faceted life. Included would be a comfortable level of work, a home life with husband and children, contributions to community life, etc. Success for a woman who is a pioneer in her field may be the achievement of firsts for her sex. The first woman telephone repairman might go on to become the first woman technical representative for a telephone company. She may not climb very high on the ladder of titles, but she will have recognition for trail-blazing.

Success for the engineer may be the accomplishment of a significant engineering task. The building of a bridge, a tall building, or the addition of a significant technical thought to the literature may be the culmination of a lifetime of work. However, the usual definition of success to the engineer means leaving his profession and moving into management. Particularly in a large corporation, the drive toward being part of the business matter decision making and future business planning leads the engineer away from technical works, and even away from technical management. Much valuable engineering talent is lost in this way. As a result, a number of large companies now offer two ladders for upward mobility. One is the true management path. The other is a technical path on which technical accomplishment is rewarded with high pay, sometimes individual research facilities, and special titles and recognition. The successful technical person may be the technical director of high level research, he may be an internal consultant, he may be a company spokesman speaking to technical communities, he may plan long range research and technical programs.

There is still a problem in having engineers recognize this as a fruitful path, and in having management give it the prestige it warrants. When engineers want to move upward they often supplement their basic bachelor's degree background with master's degree work. When this happens, I have seen a difference of expectation between management and engineers cause great problems. Some companies encourage the work, expecting increased technical proficiency, while the engineer expects management credit for it. The fault, I believe, is with the company. For too long the technical people have been limited to a certain level of pay, power and recognition. That is why the dual ladder approach may well preserve the high level of engineering capability that this country has been famous for.

Recognizing that there are a great many types of "success," what are the ways in which some upward mobility may be generated? Let's explore the following list:

Career Strategy and/or Planning
Education
Licensing
Company Training
Experience, New Skills

CAREER STRATEGY

Upward mobility should be a matter of very careful and deliberate planning. You cannot get from here to there if "there" is not defined. You can get from here to an undefined "there" if you are willing to rely on chance alone. In the past women have been the poorest career planners of all. The usual attitude has been "do a good job" then your supervisor will recommend you for a better job. That shows a high degree of dependence on superiors. A much more positive approach is to do your own career planning, with bosses offering help and guidance. This involves effort for self-evaluation of interests, abilities and ambitions; identifying career options; setting a program for gathering the necessary skills and experience for a certain level job; evaluating risks that must be taken; and allowing for changes in your situation. It is necessary to update this package every six months or so to account for changes and new ideas.

Many large corporations have adopted this form of career planning. For women employees, doing career planning has been a unique help in moving ahead.

FORMAL EDUCATION

Beyond the basic credentials of Bachelor's or Master's Degrees, formal education plays less of a role at higher level jobs. One exception is when career switching is at stake. For instance, going from purely technical work to management, one might find an MBA a great asset. Another exception is in the academic world where advanced degrees give impetus to a career. Outside the academic world, further advancement is governed by talent for dealing with new situations, initiative and commitment. Advanced degrees can lead to "over-qualification" for some jobs and are of value only where recognition for a particular expertise is desired.

LICENSING

The professional engineering license is verification of a certain standard of ability in a certain group of engineering disciplines. In mechanical, structural or electrical design, for instance, the P.E. is an absolute necessity for increased responsibility or pay. But for increased managerial responsibilities, the P.E. license will not help.

COMPANY TRAINING

Large corporations do a tremendous job of providing courses for employees in a variety of subjects. The vehicles for instruction take different forms: sometimes day-long seminars, sometimes week-long "schools" on the campus of a well-known university, sometimes task forces that work together with other corporations. The employee is encouraged to participate in that program which seems most suited to his career path. Also available are programs sponsored by such organizations as the American Management Association and many of the Technical Societies.

The so-called "people skills" which engineers sometimes lack are a frequent focus for in-company training. These courses generally have the most up-to-date content, and represent a real attempt by management to improve the caliber of people it wishes to move along.

EXPERIENCE AND SKILLS

In a well-defined career path, each set of work experiences builds on the last toward the next goal. This includes job moves which are "developmental" in nature—that is, lateral moves at certain levels to gain greater breadth of experience in a certain area. Constant re-evaluation of where your present job fits into your planning picture and constant looking for alterations in that picture are both necessary in this process.

Further skills will always be necessary as you move upward. Your basic education is never enough. If your career planning is adequate you will have identified ahead of time which skills you need. Some skills are common to both technical and non-technical jobs, and some skills are common to all types of managing, for instance, planning, organizing, staffing, implementing and supervising, controlling, and communicating. Technical people often have the planning and organizing abilities, but lack the "people skills" necessary for implementing, supervising, controlling and communicating. The ability to deal effectively with people is not necessarily a gift of nature. It can be learned, and must be learned for upward mobility on even a purely technical path.

What I have said so far could apply to men or women. But right now there are distinct problems for women trying to move ahead. The amazing fact remains that the few women with the qualification to do so are sometimes reluctant to move ahead. Much has been written about the necessity for women to change their self-image to correct this. The expectation of failure has been a well-talked-about female characteristic, as is the lack of conditioning in competitive activities and the lack of career planning.

The second area that needs change after "internal attitudes of women" are social attitudes of men in the working environment. For too long the office has assumed the atmosphere of a men's club, with females permitted subordinate roles as secretaries, coffee getters, etc. Women are now invading this precinct as equals, and the resentment may be easily seen. There is resentment when a good job has been taken by a woman (perhaps because of equal opportunity pressures) and she is subject to cries of reverse

discrimination. Resentment occurs when a woman, who for years has been a subordinate, appears as a business-social equal. She may not know all the sports jargon, and may indeed have an altogether different vocabulary. And then there is the problem of sexuality. Someone has coined the words "business sexuality." As if we don't have enough trouble understanding sexuality in other phases of our lives, now it presents itself in the business realm. Many men do not know what footing to approach women on in this respect, and many women are confused about the role they should play. And the philosophy a woman adopts influences the way she does such a basic thing as dress in the morning. The woman who is successful today has been an artful dodger of these problems. She has probably been aware of the male "group," when her presence was welcome, and when it was not. The difficult task of circumventing that groupiness has required enormous sensitivity to accomplish.

But things are looking up. Time changes things, slowly, but definitely. Attitudes will change, given enough time, and enough women who are willing to put in the effort and face the difficulties of generating their own upward mobility. In the past only a combination of unusual circumstance and unusual ability allowed a woman to reach the top. Today, although advancement of women in business or the professions is not unlimited, the promise is there. Now that there are more career options open to women, we will eventually see the day when there are a multitude of career path options to the very top.

Alva T. Matthews

Dr. Alva T. Matthews received her BS and MS in Civil Engineering and the Doctor of Engineering Science in Engineering Mechanics from the Columbia University School of Engineering.

She has served as an instructor in the Dept. of Civil Engineering at Columbia University, visiting lecturer in the engineering department of Swarthmore College, as a senior research engineer with Weidlinger Associates, and consultant to Rochester Science Associates. She is currently an associate professor in the Department of Mechanical and Aerospace Sciences at the University of Rochester and consulting with Weidlinger Associates. Her areas of research include wave propagation in solids, ground shock analysis related to nuclear weapons effects, structural dynamics, and thin shell analysis.

Dr. Matthews has received several honors including the Society of Women Engineers' 1971 Achievement Award and the Engineering Award of the Federation of Engineering and Scientific Societies of Drexel University, 1976.

Left to right: Elaine R. Pitts and Olive Salembier

Left to right: Arminta Harness, President, Society of Women Engineers and Dr. Alva Matthews, Keynote Speaker.

PROFESSIONAL DEVELOPMENT FOR ENGINEERS

Phyllis B. Berger, P.E.
Chairman, Engineering Technologies Department
Bronx Community College

I have been asked to speak on the subject of Professional Development for Engineers. I think that our Conference Chairman, LeEarl Bryant, thought I could give some perspectives on professional development because of my position on the New York State Board for Engineers and Land Surveyors.

Clearly my knowledge of the effect of registration on the professional development for engineers has grown considerably since I have been on the board. That appointment began in 1973. I became a registered engineer, however, in 1965, and had heard about registration while I was still in engineering school. When I was graduated from Cooper Union in 1946, registration was important mainly for civil engineers, and so most of us who were not civil engineers did not bother taking the EIT exam.

I worked in industry for seven years after graduation and took a master's degree while I was working. It seemed to me more important to get my graduate degree than to become licensed, and in truth it was at that time. I have been teaching at BCC since 1963. My graduate degree was important, in that I would never have been appointed to the faculty had I not had it. However, I was informed fairly quickly that if I wanted advancement, I needed either a doctoral degree or a P.E. license. Being normally ambitious for advancement, I sought a P.E. license as the easier of the two roads towards promotion. I am admitting to you, then, that my initial motivation towards licensure was a self-seeking one.

The topic, however, is professional development for engineers. Development includes advancement and, therefore, the self-seeking motivation is a legitimate one. I might add parenthetically that the delay in taking the examination necessitated a refresher course and considerable time at homework in order to be able to pass the exams. Since I was working full-time at the time, it was a difficult process. It would have been much wiser of me to have taken the examinations immediately upon graduation.

Things have changed considerably since I was graduated. My discipline is mechanical engineering, a field in which the possession of a license is now much more meaningful than it used to be, but even in the previously remote field of electrical engineering, licensure has become much more desirable. Many companies are now urging their employees of all disciplines to try to become licensed.

It would be well to spend a few minutes on the purpose of licensure, of which I must confess I was ignorant at the time I sought it. The purpose of licensure is essentially the protection of the public. A licensed engineer certifies his work where he deals with the public, in effect guaranteeing the safety of it. If bridges, roads, structures are to be built, if air conditioning, ventilating, and electrical systems are to be installed in these structures, it is certainly desirable from the point of view of the public well-being that they be safe. In order for engineers to be certified or licensed, they must present information concerning their education and experience, as well as evidence of their capabilities via an examination that shows that they are competent. If in fact they indicate through poor design repeatedly that they are not competent, the public can be protected in that their licenses can be revoked. Licenses can be revoked or suspended for other unprofessional acts as well. Therefore, the licensing of engineers is a protection for the public in that there is an avenue of redress.

The need for licensure is a great variable, depending on where one works. For example, there are exemptions written into the state laws. The industry exemption means that engineers who work for large companies—even though the work of the engineers at General Motors definitely impinges on the public safety—do not have to be licensed. There is, however, movement at the various State Boards to see if the laws can be rewritten wiping out the industry exemption. Many of the professional societies are also looking towards such change. There are complications in that licensure is a state function, and large companies obviously are interstate in their scope. My personal opinion, however, is that a way must be found to overcome these difficulties because I personally would feel safer driving in cars that were designed by engineers who had individual responsibility, and culpability in case of poor design. Power companies are another area which have historically been exempted from licensure. Most of them, however, seem to be pushing their employees towards getting licenses. Perhaps their motivation is to improve their stance, vis-a-vis public relations. Whatever their motivations, I approve of the trend.

Texas is a State which has led the way towards great expansion of the need for licensure. A law was passed in Texas, in the recent past, forbidding the use of the word ENGINEER in any title, unless that person is licensed. Many states are looking into the feasibility of similar legislation. I think it is clear, then, that an increasingly important step in professional development is acquiring a license.

Another avenue of professional development consists of continuing education. When I was a student, continuing education meant, usually, another degree. However, today

the phrase "continuing education" refers to a different approach altogether.

Frequently companies set up their own formats; for example, seminars within the company framework. I have heard also of companies that acted as extensions for local universities so that employees might take courses offered by universities within the ease and comfort of their own company walls. I don't know how widespread that particular practice is. I do know that many companies will pay the tuition of employees who take courses towards Bachelor's and Graduate Degrees at night. Some of them even give released time towards that end. But those are formal structures aimed towards a fixed goal of a degree.

There is much more talk now in the profession of another system of continuing education. The State Boards and the various professional organizations are all engaged in dialogues as to how continuing education for practicing engineers can be provided and evaluated. There is contemplation among the State Boards as to a tie-in between continuing education and re-registration. I should add parenthetically that an engineer who meets the qualifications of education, experience, and examination can be considered licensed for life. However, he or she must re-register bi-ennially in order to use that license. No formal state actions have yet been taken to tie the requirement for continuing education into the law. The reason is the difficulty of establishing the nationally recognized Continuing Education Unit or CEU. There are formal courses given by various universities under the continuing education program. I have received brochures from George Washington University which show scores of short courses in many specific areas. There is no question that such short courses in areas of interest will do much to upgrade the state-of-the-art.

However, a vehicle for continuing education might well be professional journals. Certainly they frequently print articles showing the latest developments in the various fields. Another vehicle might be professional societies' meetings where papers are read giving the latest results in research in various areas. Subscribing to a magazine, however, does not ensure reading it, nor does attending conferences ensure listening to and absorbing the information given. Therefore, there is currently a great lack of consensus among the various professional societies as to how to rate continuing education. The American Society for Engineering Education at its 84th Annual Conference in Tennessee in June, 1976 discussed the whole range of experiential learning experiences. These included on-the-job courses, cooperative education, and company based courses. The Continuing Education Studies Board adopted several recommendations of its task force on the CEU. They opposed the adoption of the CEU as presently defined as a standard for measuring individual continuing educational achievement. They opposed the use of CEU's as a condition for licensing or re-licensing. They called for coordination in its actions regarding CEU's with other professional bodies. They recommended that a task force be assigned to study mechanisms for nationally coordinating the recognition of continuing education.

Simultaneously the ASEE has received notice of a grant from the Carnegie Corporation to the American Council on Education for the establishment of a task force which will attempt to define a system of credits and credentials from all educational alternates. This will be a two-year effort. Most of the professional societies in the engineering field are developing or have already established some program related to certification and/or continuing education. I was asked to prepare a report for the New York State Board. My recommendation is that we wait and see what the new task force will produce. Whatever its results, I think that it is clear to all of us that the professional development of all engineers will have to include some form of continuing education in the future.

Phyllis B. Berger

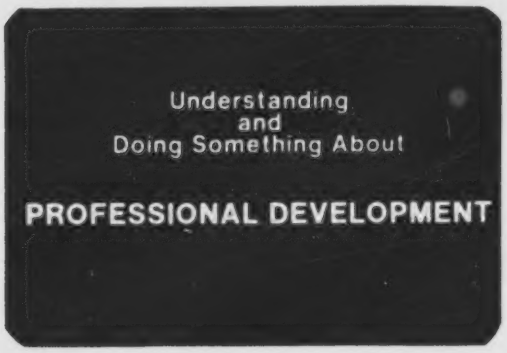
A registered engineer in the state of New York, Phyllis Berger received her B.S. degree in Mechanical Engineering from Cooper Union and her M.S. in Fluid Dynamics from Stevens Institute of Technology. She is currently chairman of the Engineering Technologies Department at Bronx Community College.

Prior to her present position, Mrs. Berger was a lecturer at Queens College. Her industrial career included engineer positions with Greer Hydraulics, Consumers Union, and Chance Vought Aircraft. She is the first-woman to be appointed to the New York State Board for Engineering and Land Surveying by the Regents and State Education Department. She is recipient of a Professional Achievement Citation from Cooper Union, the Allan R. Cullimore Award from Newark College of Engineering, and an award for outstanding contributions to engineering education from the New York State Society of Professional Engineers.

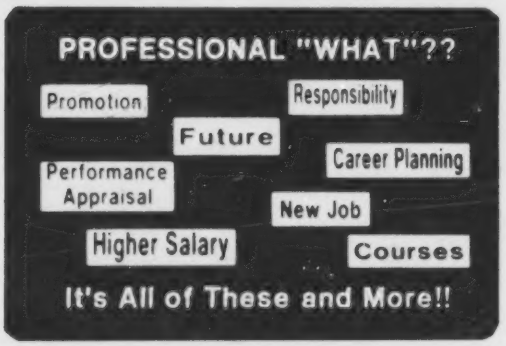
UNDERSTANDING AND DOING SOMETHING ABOUT PROFESSIONAL DEVELOPMENT*

Dr. Lindon E. Saline
Manager - Professional Development Operation
General Electric Company

This presentation focuses on professional development for professionals and managers. Whether one is talking about professional development for engineers, managers, accountants, physicians, educators or whomever, it's really based on the same general concept and process. Specifically, the subject is "Understanding and Doing Something About Professional Development."

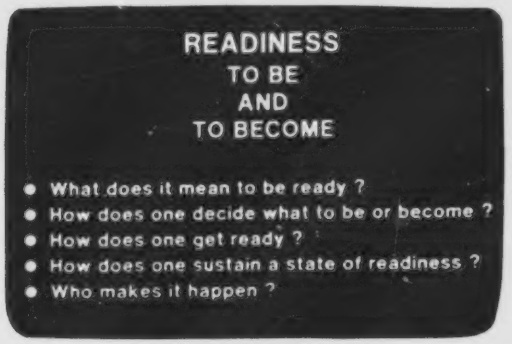


When I use the words "professional development," some word that means something special to you probably comes to your mind. They include a wide range of subjects—promotions, new jobs, salary increases, or whatever. I can assure you of this: whatever your thought is, you're probably right!! As a matter of fact, it's all of those individual thoughts and even more.

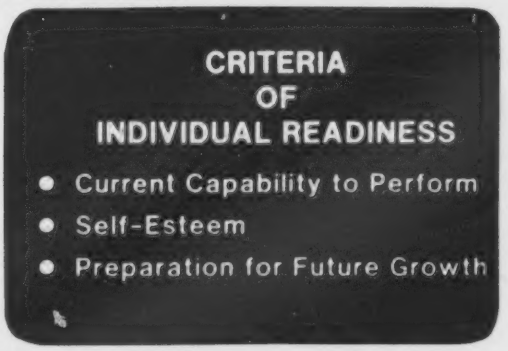


*Adapted from lectures to a variety of audiences including the 43rd and 44th Annual Meetings of ECPD; 1976 ASEE College Industry Education Conference; 1976 ASTD Annual Meeting; Upward Mobility and Professional Development for Women Engineers Conference; Executive in the Classroom Program, Purdue University; and others.

Personally, I look on professional development as a process that determines our "state of readiness to be and to become." Those are very fancy words that "sing" from a rhetorical point of view, but need further definition to provide a basis for answering some of the kinds of questions that those fancy words have generated in your minds. What does it mean to be ready? How do we get there? How do we make it happen? These are important when we're considering professional development in relationship to ourselves as managers or employees or even as just "people".


READINESS
TO BE
AND
TO BECOME
What does it mean to be ready ?
How does one decide what to be or become ?
How does one get ready ?
How does one sustain a state of readiness ?
Who makes it happen ?

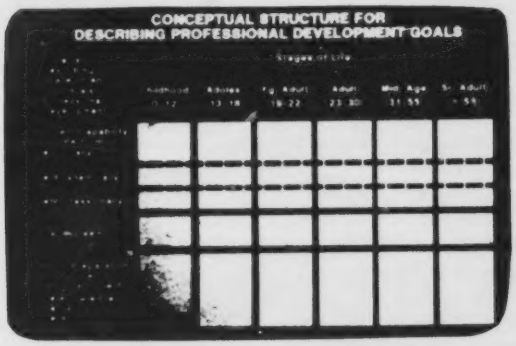
I have found three criteria helpful in defining and specifying the state of readiness. The first is our current capability to perform socially, academically, and professionally. The second criteria has to do with self esteem which depends on how each of us feels about our competence and our worthiness. If, in our own viewpoint, we don't feel competent and worthy, we are probably *not* going to perform very effectively in our jobs nor in our professional development. The third criteria useful in describing a state of readiness has to do with our preparation for future growth: the knowledge, skills, and attitudes that will help us to grow, to be capable of performing in whatever way we want to perform at some future time in our life.



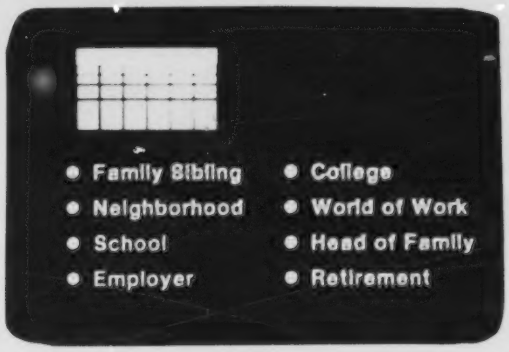
There is no universal or timeless set of goals associated with each of those criteria because they change at each period in our life. For a few moments, think of life as a series of stages. I've arbitrarily chosen six stages of life—you can choose three stages or two dozen stages. It really doesn't make much difference how many stages or what you call them.

STAGES OF LIFE	AGE RANGE
Childhood	0-12 Years
Adolescence	13-18
Young Adulthood	19-22
Adulthood	23-30
Middle Age	31-55
Senior Adulthood	>55

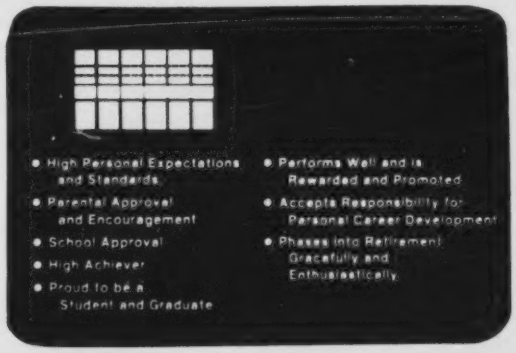
But how do we relate the criteria of readiness with the stages of life? Since I am an engineer, the inevitable answer, of course, is a matrix. So, use the readiness criteria for the rows and the stages of life for the columns. That matrix provides a convenient conceptual structure for thinking about professional development goals. Now each one of you can write whatever goals you want at any given stage of life. If you filled out such a professional development matrix (no easy task, incidentally), you would gain a sense of process, the ongoing nature of professional development. We can't take the time for each of you to do that now so we are going to look very quickly at several different cuts at the matrix as I have filled it out.



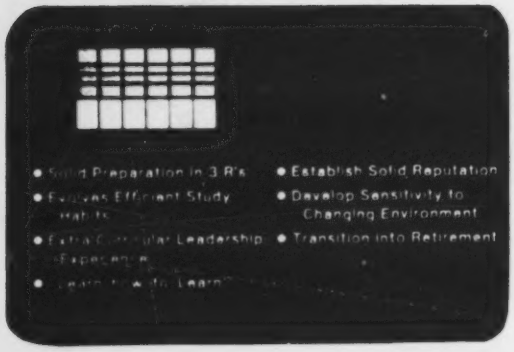
First, look at the row labelled "Current capability to perform socially." As you quickly read those abbreviated goals, let your mind proceed from the left side of the matrix to the right side—from childhood to senior adulthood—and get a feel for the changing nature of the goals associated with that criteria. For example, just to elaborate a little bit, in our early childhood our first social performance criteria is to be an effective member of our family. And, then, as we move on through life, we must perform socially in school, in college, and eventually in the world of work and into retirement. Clearly, some of the goals carry over from one stage into the next.



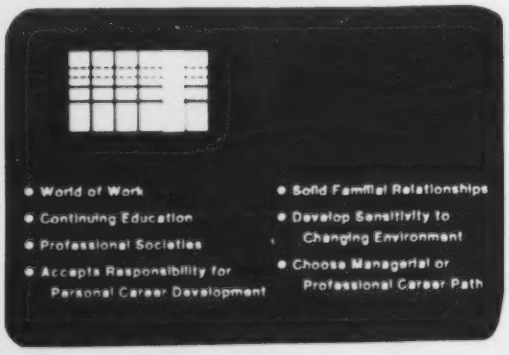
Let's look next at the row called "Self-Esteem." Here, it's very important early in life to develop high performance expectations and standards for ourselves, to experience family and parental approval, and to experience some successes in whatever we do in school and other activities. As we move through the stages of life, our professional development should help us maintain and develop the high self-esteem that will facilitate our moving gracefully and enthusiastically into senior adulthood with changes in our work and/or activities.


• High Personal Expectations and Standards
• Parental Approval and Encouragement
• School Approval
• High Achiever
• Proud to be a Student and Graduate
• Performs Well and is Rewarded and Promoted
• Accepts Responsibility for Personal Career Development
• Phases into Retirement Gracefully and Enthusiastically

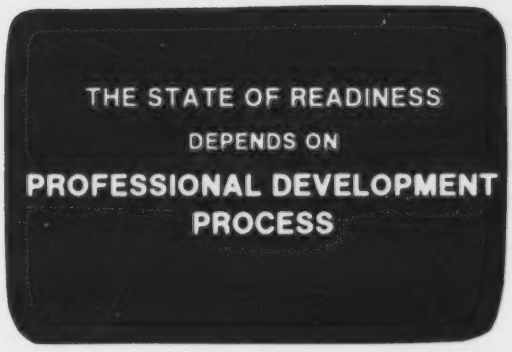
Let's look next at the row called "Basic Preparation for Future Personal Growth." The kinds of things that seem important here are, first of all, solid preparation in the three R's. I want to give special emphasis to the ability for "learning-how-to-learn" as an important professional development goal since that capability enables us to cope with change and to minimize the impact on our lives of forces that lead to technical obsolescence. One of the most critical goals for early adulthood and beyond is to establish a solid reputation in our work as a foundation for future growth.



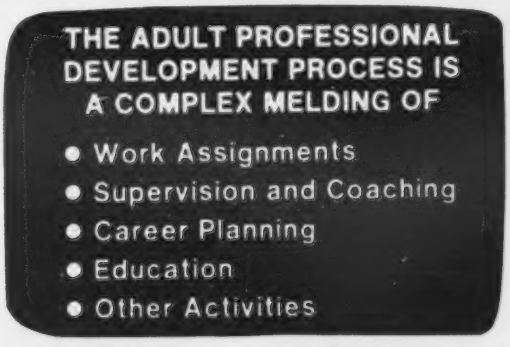
Next, let's take a vertical cut of the matrix—the stage I label middle-aged or 31-55 years of age. Visualize moving downward through the readiness criteria from performing socially, academically, professionally—through self esteem—to preparing for the future. What are the goals that describe a state of readiness for middle-agers? We middle-agers must certainly relate socially in the world of work—with our peers, bosses, subordinates, customers, and so on. Our academic goals might properly relate to continuing education and participation in professional societies. One goal that is not listed here but is absolutely critical (and perhaps goes without saying, but deserves to be said) is to perform well in whatever job we have. Generally, at this stage of life, we make choices between the managerial route or the professional route. Or, perhaps, we do some experimenting and move between one or the other of those paths . . . even on a lateral basis.


• World of Work
• Continuing Education
• Professional Societies
• Accepts Responsibility for Personal Career Development
• Solid Familial Relationships
• Develop Sensitivity to Changing Environment
• Choose Managerial or Professional Career Path

Of utmost importance here is *not* to get hung up on the specific goals I listed because each of you has your own view. And may I remind all of us, there have been books written on each of the elements in the matrix so this is not the end-all. The purpose of this brief review of the conceptual structure is to convey the notion that professional development is a process that is life-long in nature.

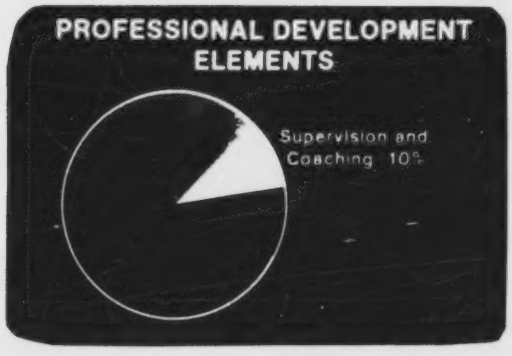


Professional development, as a process, can help us achieve whatever state of readiness we want at the stage of life we are in or heading towards. Professional development provides a framework for looking ahead to future stages of our life, for choosing paths we would like to traverse, and for setting goals we would like to achieve. It affects our lives as people or as employees, and depending on how well we use the process, we affect the lives of others in our role as managers. The professional development process is very complex and consists of five primary elements. We will review each of these elements briefly.

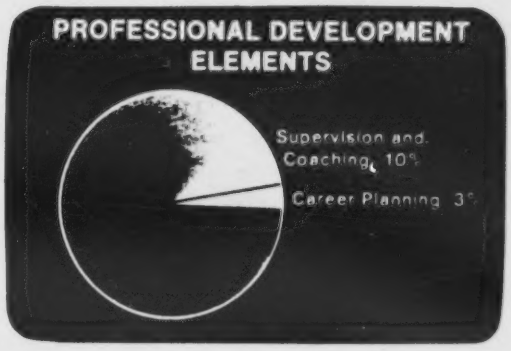

THE ADULT PROFESSIONAL DEVELOPMENT PROCESS IS A COMPLEX MELDING OF
• Work Assignments
• Supervision and Coaching
• Career Planning
• Education
• Other Activities

If we regard the total *adult* professional development process as 100%, I would suggest that the work assignment constitutes about 80% of professional development. An illustration may be helpful. If, for example, you would like to pursue a professional career relating to steam turbine design and if you would like to be one of the world's expert bucket designers, you better get into the work of designing buckets. Similarly in management, if you are going to develop as a manager, you better do some managing work. As obvious as these illustrations appear, the *importance* of the work assignment in professional development is frequently overlooked. The kind of work assignments that are critically important to professional development are those that have challenge, that stretch your mind, that make you move out just a little farther in the acquisition and application of new knowledge, skills, and attitudes.

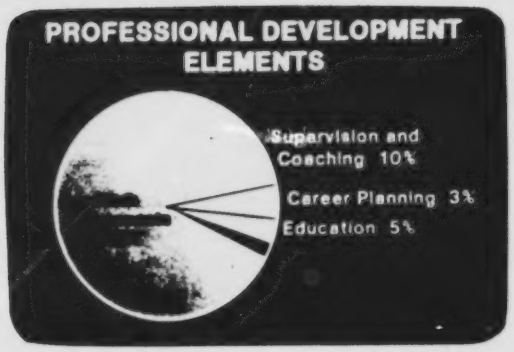
The second major professional development element is coaching and supervision. I assign about 10% to coaching and supervision. Clearly, the early years in an organization and the quality of supervision and coaching are very influential and critical to the total career performance that one achieves. What do I mean by supervision and coaching? If you think in terms of an athletic analogy, you're just about right. What do good coaches generally do in an athletic situation? They will help you understand your strengths and weaknesses. They will help you correct those weaknesses and to utilize your strengths. They will challenge you, encourage you, and occasionally even let you fail under controlled situations. Not when you are going to have a personal disaster if you fail, nor if the team is going to suffer a disaster. But controlled failure can be an excellent learning and development experience. That's the kind of coaching and supervision that is important in professional development.



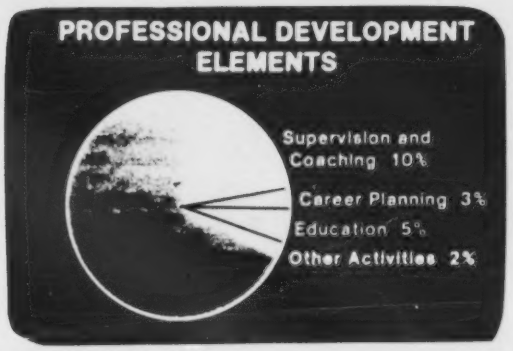
A third element in the professional development process is career planning.[1] Career planning is asking yourself and answering for yourself critical questions such as: "How did I get where I am today?" "Why am I where I am?" "Where would I like to be at some time in the future?" "What am I willing to trade off to get to where[2] I think I would like to be?" and, then, very importantly, "How am I going to get there?" The immediate goal of career planning is to help you define specifically what is the *next* professional development action you should take to help you move toward whatever longer range goals you want to achieve. Too frequently, individuals act as though they believe that career planning is dreaming about the rosy glow, the golden pot, ten, fifteen, twenty, or thirty years ahead. One should and must look to the future, but then one should come back to the here and now and answer the question, "What is it that I should be doing next Monday morning to further my progress along whatever path I'm going to take?" Career planning is at once a most difficult and most satisfying activity. The reason is that there are no right or wrong answers to career planning. There are only honest and dishonest responses. Certainly, your supervisor, your spouse, your family, your friends, will all want you to do what is right for you. But if you don't care seriously about your career, why should anyone else care about it? You are the one who has the primary responsibility for your career planning and only you can be honest or dishonest about your responses to those kinds of questions.



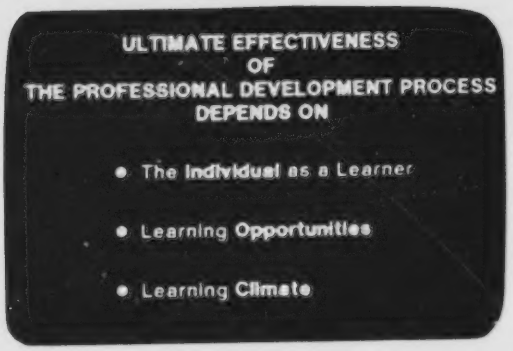
The fourth professional development element is education. This is worth about 5%. It may be in-house, at a local university or college, or in a technical/professional society. It may be a self-study program that you undertake at home, or whatever. I like to emphasize that education is only about 5% of professional development because too frequently individuals equate professional development and education. Adult education, per se, is not essential for moving ahead in one's career. It is useful in one's professional career only when, indeed, it helps you perform more effectively. Certainly, there are some professional areas (for example, in certain public school systems) where one can get an increase in pay because one adds another degree or so many hours of educational activity. You may be disappointed if you go on for that Masters degree at night, or if you go on for that Doctorate at night, since that is not the automatic route for advancement in most businesses. Generally, in the world of industry and business, educational credentials alone are nothing without performance. If you are thinking about education as a means for enhancing your career, education should be done purposefully: the right subject, the right kind of education, at the right time. Let me hasten to say, however, that the end-all of education for any individual need not be job-oriented or career-oriented. Education can be pure fun. It's fun to learn new things. If we pursue education for pure fun, then we must avoid confusing that purpose with preparation for career advancement. What I'm suggesting is that education–well chosen, well executed, well timed–*can* be important in your professional development.



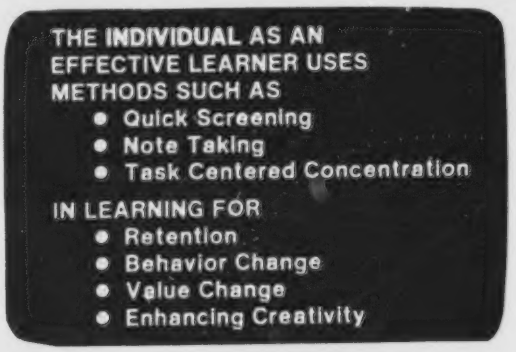
The last professional development element is a very innovative one called "other," only 2%, but a very important 2%. The kind of things I include are participation in technical/professional societies, the community, church, hobbies, and leisure/recreation activities. Those pursuits can be very useful to professional development and help make an individual a whole person. "Other" activities are particularly valuable for younger people. They offer unusual opportunities, for example, to test whether one likes leadership and management activities. In the community—in the church—in technical/professional societies there are unusual opportunities to take on major management jobs at a very young age relative to the same kind of responsibilities one might get in a formal business organization. Managing in voluntary organizations may be tougher than in a business setting. These are win-win situations for the individual and society at large.



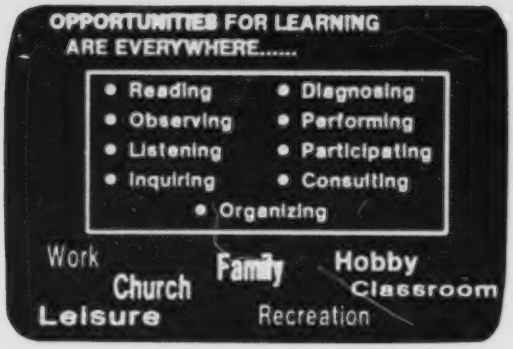
This, then, is a view of the elements that comprise the complex process we call professional development and that determines, at each stage of life, what our readiness is to be or to become. Simple enough perhaps, but then we ask ourselves, "Who is responsible for making this happen?". The ultimate effectiveness of professional development depends first on the individual as a learner, second on the learning opportunities that are available to the individual, and third on the learning climate. Let's review these responsibilities in more detail.


ULTIMATE EFFECTIVENESS OF THE PROFESSIONAL DEVELOPMENT PROCESS DEPENDS ON
• The Individual as a Learner
• Learning Opportunities
• Learning Climate

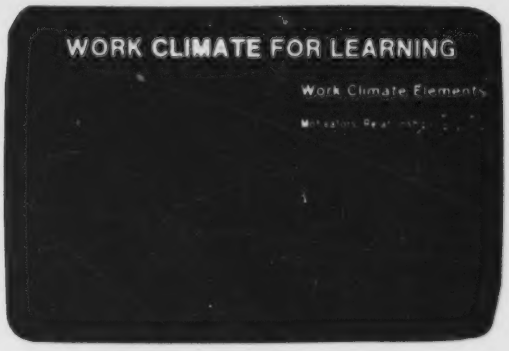
The individual as an effective learner[3] uses several run-of-the-mill, non-glamourous methods—each one of which may seem very obvious to you. How do you take good notes? How do you focus on a task? What are you learning for? Is it retention? behavior change? value change? enhancing creativity? Many—perhaps most—professional people do not know how to learn effectively. I want to emphasize—*Do Not Know How to Learn Effectively*. Do you know how to learn? What approaches do you use in various learning situations? Although there are individuals who intuitively know how to learn, *most* of our education—elementary, secondary, college—does not develop our learning capabilities very effectively.



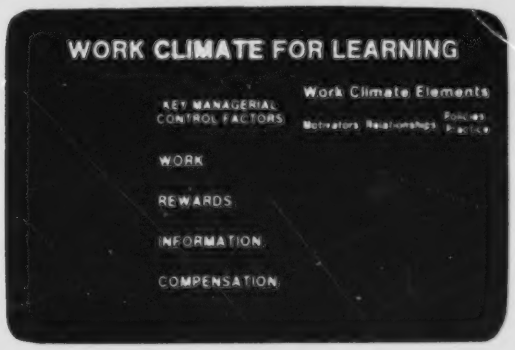
Giving specific attention to the formalities of learning, how to learn can be an important contribution to your continuing professional development. As individuals, we do many tasks, each of which can help us learn. Look, for example, at the tasks we do all day long: we read, we listen, we perform, we organize, we diagnose, and so on. Using the skills of learning in performing the tasks that we do in our daily lives, we find ourselves in a total learning environment. It is literally true that opportunities for learning are everywhere: in the office, at home, on the golf course, at church, in the community. You can't be anyplace without having an opportunity to learn.



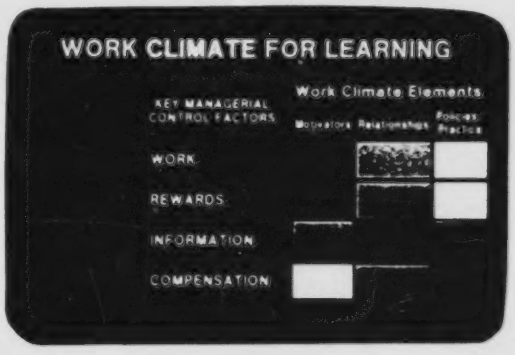
There is also a very important responsibility relating to a work climate that facilitates and encourages learning and professional development. By work climate, I mean the kinds of elements such as policies and practices, relationships, and motivators that influence our feelings and attitudes about where we work. Herzberg's Hygiene-Motivation theory reminds us that the policies and practices end of the spectrum includes factors like pay; the kind of office you have; the availability of lab technicians, computer capability, and secretaries; and so on. All of these are very critical to carrying on work. Without those kinds of factors, an organization can't really function. But having those "in spades", does not necessarily create a motivating, a professional-development-oriented, work climate. What is needed is to work across the spectrum and examine the kind of "relationships" you have with the boss, with peers, with the boss's boss, with subordinates and others. And then you can move further along the spectrum to "motivators." There you should find work and operational characteristics that focus on challenge, stretch, responsibility, control, and so on. How much "say" do you have about how the work is going to be done, the schedules you perform to, the standards of performance? The qualitative nature of work climate should not detract from its importance in professional development.



But now let's look at another aspect of work climate; namely, what are the factors a manager has within his or her control to help determine the quality of work climate? There are four basic managerial control factors: the kind of work an individual is assigned or not assigned, the kind of rewards an individual is given or not given, the kind of information shared or not shared with the individual, and finally, how a manager utilizes the compensation system.

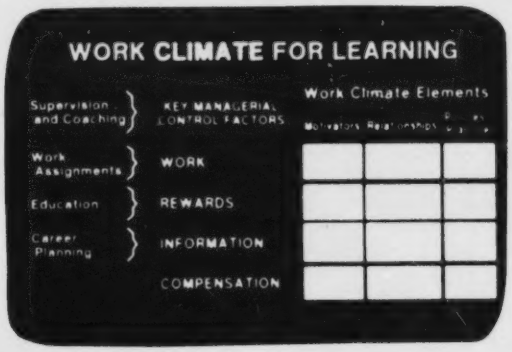


Clearly, the managerial control factors do not impact uniformly on the work climate elements. The deeper the color of the element in the work-climate matrix, the greater is the impact of the managerial control factors. Ideally, the motivating work climate, the work climate that encourages the professional development of employees, depends heavily on how the manager uses work, rewards and information in the motivation of employees. That is really the greatest challenge that a manager has—to set the kind of work climate that encourages professional development, including high performance.



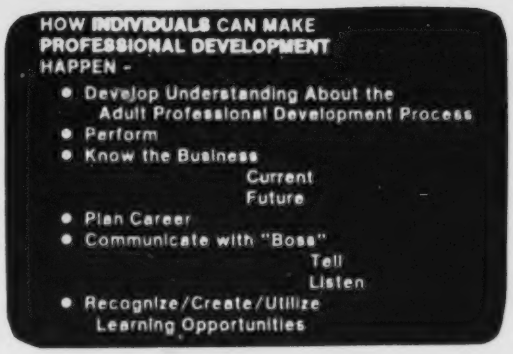
How does the work climate relate specifically to professional development? Recall the main elements of professional development. *Supervising and coaching* has to do with how the manager utilizes the managerial control factors. *Work assignments* correlate directly with work as a control factor and focus on challenging, stretch work assignments, given in the right way, with as much employee control and responsibility as feasible. *Education* is one kind of reward. Your boss may be saying, "Your performance deserves the opportunity to prepare to do even better. I have confidence in you." Other kinds of rewards that bosses have range all the way from the pat on the back and some "atta boys", to giving you an opportunity to make presentations to super bosses, to encouraging your participation in technical meetings with the related professional visibility. Rewards are a way the boss lets you know on an

almost instantaneous basis that he or she appreciates your performance. *Information* relates very much to career planning. Eyeball-to-eyeball kinds of discussions are critical to career planning. Our bosses can, in frank, open ways give a sense of realism to our personal assessment about our capabilities and aspirations compared with the opportunities that may be available. The boss can give the kind of information that says, "This is where our organization is going, here is where our longer range plans are moving us, these may be the factors that will tend to upset our long-range plans, here are the uncertainties, these are the golden hopes for our organization." That kind of information is important to career planning. I would also hasten to say that information flow should not be simply one-way. Each of us is obligated to participate meaningfully and forthrightly in the information exchange. Bosses are not superhuman people who can read minds (although many times we try to do that, usually to the disaster of both the organization and the individuals involve. The point is that effective information flow must be a two-way street.

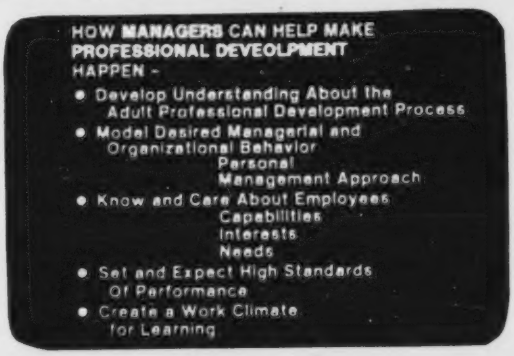


Work climate for learning and professional development is very critical along with the *individual's responsibility* to make use of the *learning opportunities* that are available everywhere. However, these factors alone may *not* be enough!! Being "lucky" is also an invaluable condition for accelerating progress along your career path. Even though it suggests uncertainty or randomness in happening to be at the right place at the right time, "being lucky" is a truism that must be accepted as a condition for career progress. More important, recognize that uncertainty relating to career development *can* be systematically reduced. Analyze, for example, the situation of any individual who is known to you and appears to "be lucky" in career matters. You will likely find four important factors present in that individual's situation: (1) performance on current job is top-notch; (2) is prepared to move easily to new jobs; (3) has gained perspective from career planning to know what is "right" career-wise; and (4) has patience to wait for and to accept a new job only when it is "right" for the individual and the company.

In this kind of presentation, I have an overpowering need to be somewhat prescriptive. So, I will risk satisfying that need by mentioning briefly the responsibilities of individuals, managers, educators, and technical/professional societies for professional development.

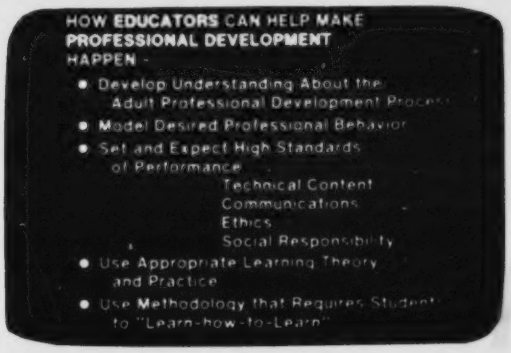


I would like to emphasize three of the individual responsibilities on the list. The most important action for an individual, as far as professional development is concerned, is to perform in an outstanding manner on the current job. There is nothing like performance to set a solid base for recognition, consideration for advancement, and new kinds of learning opportunities. I'd like to emphasize just once more: *communicate with the boss.* Both tell and listen. Ideally, the boss should make it easy for you to communicate; but very often, bosses don't do that. If they don't then you have to figure out ways to make it possible for you and the boss to communicate. The last responsibility on the list is critical too: recognizing, creating and utilizing learning opportunities. How many people have you observed moving into what people thought were dead-end jobs; and the first thing you know, they've transformed that dead-end job into an exciting, meaningful, well-recognized kind of position? Why? Because they knew how to recognize, create and utilize learning opportunities. Each one of us has more learning opportunities than we are taking advantage of, even today. And that is the greatest opportunity and responsibility for each of us in professional development.

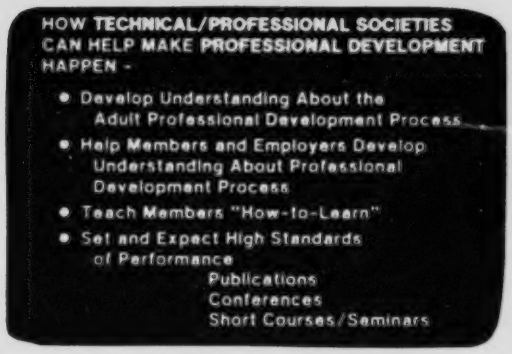

HOW MANAGERS CAN HELP MAKE PROFESSIONAL DEVELOPMENT HAPPEN -
• Develop Understanding About the Adult Professional Development Process
• Model Desired Managerial and Organizational Behavior
Personal Management Approach
• Know and Care About Employees
Capabilities
Interests
Needs
• Set and Expect High Standards Of Performance
• Create a Work Climate for Learning

The responsibilities of managers relative to professional development are critical to individual development. Consider the one about modeling the desired managerial and organizational behavior. In the whole area of professional development, many bosses fall into the routine of practicing, "Don't do as I do, do as I say." They don't take the opportunity to think through their own careers, their

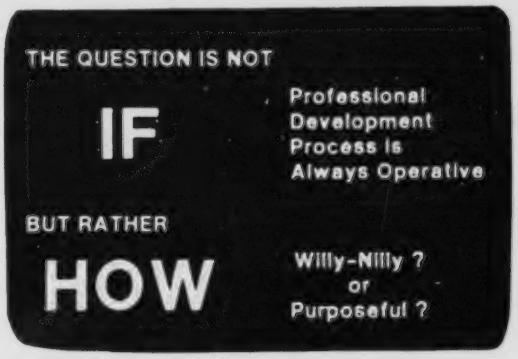
own values, why they are doing something. They ignore or even pridefully avoid formal educational experiences. By the passive or avoidance behavior they clearly telegraph to their people a message: "I—the boss—feel that professional development actions are *not* important." If bosses do not participate in technical/professional societies, how do their employees know that they are an acceptable kind of activity for them? Now about setting and expecting high standards of performance. If you don't have a boss who demands enough of you, who doesn't expect you to do well enough, you've got problems!! And you'd better then recognize them and give extra attention to setting your own standards of performance. If you don't, nobody else will and you may well find yourself developing habits of performance that will lead you to essentially nowhere. One of the greatest services that a boss can render is to expect the best performance from his or her employees.


HOW EDUCATORS CAN HELP MAKE PROFESSIONAL DEVELOPMENT HAPPEN -
• Develop Understanding About the Adult Professional Development Process
• Model Desired Professional Behavior
• Set and Expect High Standards of Performance
Technical Content
Communications
Ethics
Social Responsibility
• Use Appropriate Learning Theory and Practice
• Use Methodology that Requires Student to "Learn-how-to-Learn"

How about the responsibilities of educators for professional development? I will mention only two here. They are toward the bottom of the list—learning how to learn and the appropriate educational theory and practice. It's unfortunate that with all of the advances we are making in our society today that most educators are still using pedagogy as the theory of learning and teaching as opposed to androgogy. Pedagogy is how to teach children—how most of us were taught in elementary and secondary school and even college for the most part. Androgogy[4] has to do with the art and science of helping human beings (including adults) learn. It's very critical that educators start to use androgogical theories and approaches; because in the next 5, 10, or 50 years, the beautiful rhetoric about life-long learning will become reality. Adults will be a major segment of the "student" population, and they deserve (and will demand) the best in educational methodology and practice.


HOW TECHNICAL/PROFESSIONAL SOCIETIES CAN HELP MAKE PROFESSIONAL DEVELOPMENT HAPPEN -
• Develop Understanding About the Adult Professional Development Process
• Help Members and Employers Develop Understanding About Professional Development Process
• Teach Members "How-to-Learn"
• Set and Expect High Standards of Performance
Publications
Conferences
Short Courses/Seminars

Technical/professional societies have an important role, too. There is a great deal that technical/professional societies can do. Think in terms of the numerous conferences, publications, and seminars sponsored by technical/professional societies. All of these are important contributors to professional development. I would hope that technical/professional societies would give major attention to helping those of us adults who have not perfected our learning-how-to-learn skills to be more effective learners. They can help us develop those skills so that, as we progress through life, we will perform more effectively, minimize the pressures that force us toward technical obsolescence, and know how to cope with the changing society.



The central message is the following: the question relating to professional development is not "if" there is professional development, because professional development is operative at all times. The real question that most of us must face (as far as professional development is concerned) is not "if" but rather "how". Is professional development in each of

our lives going to be willy-nilly or purposeful? Only you and I, as individuals, can answer that question. Certainly when we've answered it for ourselves, we should expect help from our bosses. They can help by creating the motivating work climate and by providing us the opportunities to learn and to develop. But if we don't ask ourselves the tough questions and decide where we want to go as far as our professional development is concerned, be assured, it will be willy-nilly and we will deserve the "surprise" that may be ours. And, as the saying goes, "You'd better be careful about *not thinking* where you might want to get, because you may succeed in getting there."

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[4]Malcolm S. Knowles, *The Modern Practice of Adult Education*, New York: Association Press, 1970, Page 38.

Lindon E. Saline

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TECHNICAL VIEW FROM THE TOP

Dr. Martha J. B. Thomas
Manager, Technical Assistance Laboratory
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"He was one of our top scientists or engineers before *they* made him manager." "Boy, what I would give to get back to the production floor again, but one has to go into management to advance in this world!" These two statements, or many modifications thereof, are frequently heard in today's technical world. Both indicate that the involved scientist is at best a reluctant manager, (or more normally a bad manager). In any case, this scientist/manager represents a double loss to his company–his scientific innovative output is lost; and when he manages poorly, the output of the managed is diminished ultimately to the vanishing point, and then lost. Because of the frequency of hearing such comments, it might be of value to determine first their validity; secondly, if true, how a situation can be, or is being improved. Going back to high school and then to college, the prototype of the future engineer begins to evolve. He is usually serious minded, comfortable in math, likes challenge, loves to problem solve. Combined with these characteristics is usually a person of considerably above average intelligence and drive. Now, by a choice of science or engineering as a career, he has selected the most time consuming, difficult, and in some cases the most narrow study curricula in college. Finally, he has probably thoroughly enjoyed, at least intellectually, the regimen, the colleagues, and the anticipation of a rewarding career in his chosen field. Up to this point, all will agree that his field of expertise is narrow. He likes, or even prefers, dealing with things rather than people.

Now, he has completed the training necessary to launch his career. It may be in industry, government, or academia. From this point on, career progress will be measured by increased competence in the specialized field. Any recognition will stem from his ever-increasing expertise and output. These are measured both with respect to quality and quantity. Recognition comes in the form of promotion and salary increases.

It is well recognized that during this period the scientist's drive and creativity control the upward mobility of his career. It is at this point that the first separations based on talent become apparent. Many times a well-defined, clearly blueprinted purpose to move towards a goal becomes a requirement for the young engineer; a requirement encouraged by education and early practical experience.

Another portion of this group of scientists has not succumbed to the submersion of ideas. However, of these a portion are simply idea centers. While often they are catalysts for progress, an idea alone is not all that is required in the creative process. As is indicated by patent requirements for success, ideas must be "reduced to practice". This usually requires a feeling of idea importance, a staying power to conquer technical deficiencies or temporary blockage, which may occur, and a desire to understand the idea in all its detail. At this point of the scientist's career, the "high performers" have bubbled to the surface of the technical pool to be chosen for further promotion by "top" management.

Let us revaluate the type of person that is now being considered. He is usually a success in his own field, so much of a success that he has attracted attention. He is in many cases an expert in an engineering field, sometimes very narrow in scope, but his expertise is well known. He has been able to control his critical approach so that it has neither wasted his own or others' innovation. In many cases, he has generated a very high enthusiasm for his work which generates throughout the group.

Under normal progression, the only further promotion possible is to a position of managerial responsibility. In all careers, this step is the *giant* step. It is particularly critical in the scientist's case as it requires a whole change in outlook. From here on, he will be evaluated not on the things he does, but on things he gets done. He no longer deals with things but with people. This is the point where the scientist fails, or his actions at best lead to an unsatisfactory situation.

Few scientists have been or are being prepared for this radical shift in the nature of their work or responsibilities. Many of their reactions to this change just accentuate the problems.

There are many approaches to this change–mostly wrong.

1. Some believe that simple delegation of authority is the answer. When people do not respond to this delegation immediately, the new manager becomes frustrated and confused. A final solution can only be achieved if the ability to lead surfaces in time.

2. Another approach is to regard the change as just another promotion. In other words, to continue to try to be the highly regarded technical specialist as well as the manager. If he has just left a full time position, there is no way that he is going to continue to do this work plus the new more demanding managerial efforts, without doing a poor job in both areas. Because this is often the way the scientist chooses, his low scores in managerial fields are not surprising.

Although the above indicates that perhaps the only way to successful management is to irrevocably cross the line from scientist to manager, upper management often cannot accept this and will continue to expect scientific expertise as well as management, thus leading to a completely untenable position.

Thus far, the scientist or engineer moving along has been the only one considered. Let's consider the overall company organization. Management experts have studied it and how it works. For the most part they have been able to identify people with roles. Take Jones, he's the boss. He's the leader. Draw a rectangle around his name and name the rectangle, president. Draw lines to the people who assist him directly; place rectangles around their names; and name the rectangles, vice-presidents. And so on. Much time and effort has gone into analyzing the people occupying these squares and rectangles. Today, there are automatic organizational blueprints for a company, largely because the positions are so stereotyped. Tradition and competition has assigned their value.

These automatic organizational charts in no way consider the technology base of the business. It is extremely difficult to draw squares and rectangles around the names involved. In fact, by applying the rules of the rectangle game, some management analysts have discovered that they could destroy the technology base. How to maintain the productivity of that base which to date has been singularly intractable to the rules of "organization principles" primarily because, to take an extreme example, the Langmuirs' and the Steinmetz's are not reorderable, replenishable, or even identifiable amongst next year's graduating class, is the question.

Many approaches have been made in an attempt toward solving the problem. At one extreme, scientists were let manage scientists in the Ivory Tower approach in which we have isolated them. At the other extreme, attempts have been made to give them something obviously useful to do such as technical support to sales. Neither approach appears to have provided business with that vital elusive thing called a technology base.

Companies which have "it" have been studied. Their people have been put in rectangle squares, octagons, and circles. Operational lines have been drawn until the chart looks like the work of deranged spiders. Functions have been ascribed to positions, and as soon as they are, they cease to be done. *But* the value of the technology base cannot be denied.

It might be an extreme statement, but the current modus operendi for maintenance of company technology appears to be here now and label later. One hears, assigns, sorts, selects, and allows those selected to grow. With this process come titles sequentially from junior to senior status. Additional interim titles along with monetary reward are created and assigned as the person's value to the company becomes evident.

This type approach can evolve into a system which has a label that makes everyone happy. The scholar of management in academia, the conglomerate president, and the engineer on the line. It's called the *double-ladder*. The double-ladder means simply that two roads for advancement have been established. One, for the one who likes to do things - the specialist; and two, for the one who enjoys getting things done - the manager. This approach exists in other careers as well. In sports, the manager and the star player, in academia, the professor and the department head.

The figure included is a representation of a more or less typical double-ladder arrangement used in industry. It should be noted that most engineers start the ladder while it is still single. Also, there is the ability to switch from one ladder to the other. In fact, in some cases, this is encouraged in the earlier grade levels. Often, once a new process or product emerges from the company's engineering groups, the person largely responsible for it is encouraged to follow through the pilot plant period and even the production period. Such a progression would obviously entail a jumping from one to the other ladder. This type approach introduces fundamentals of management early in the career.

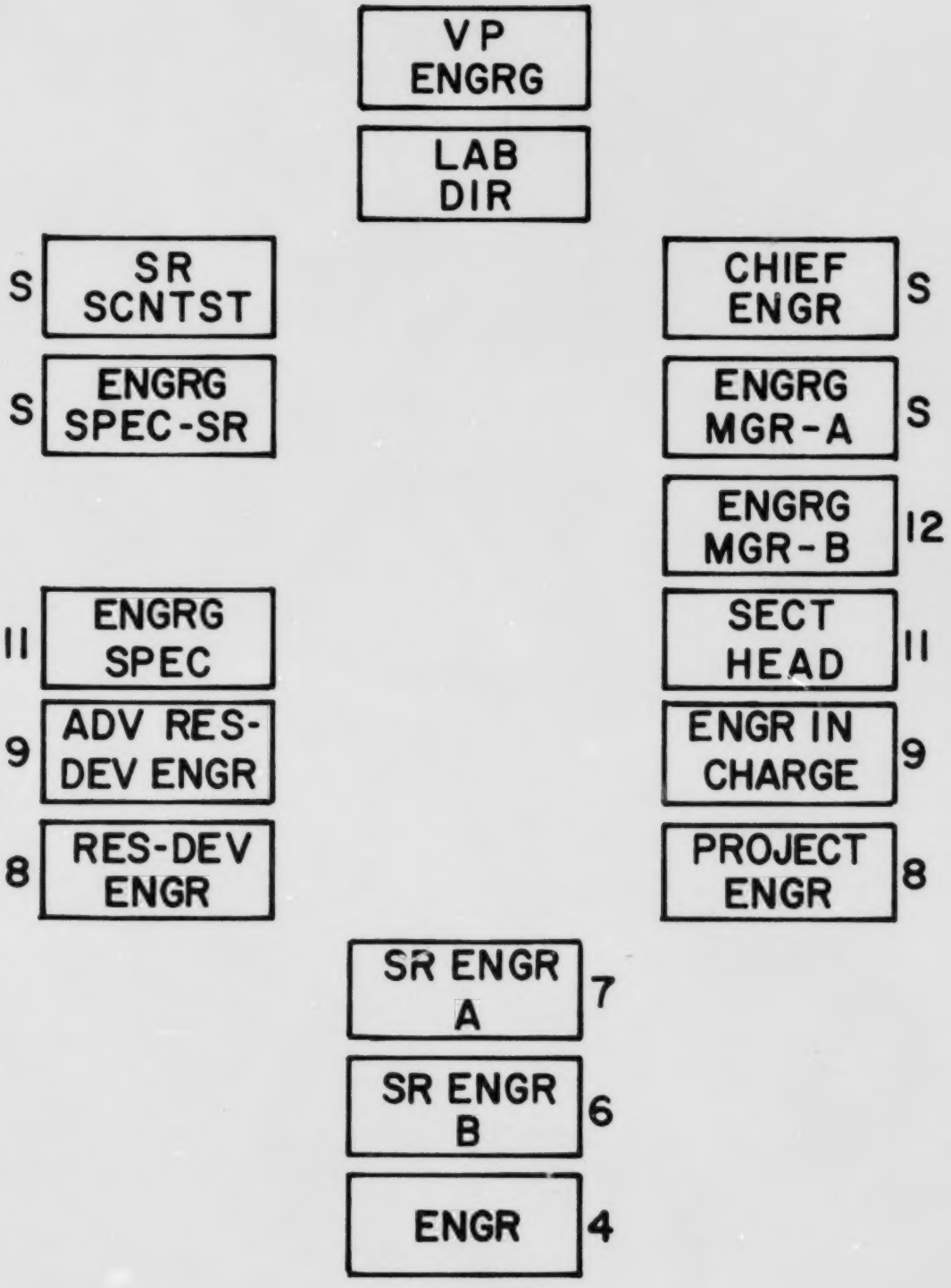
In theory, this approach tries to indicate that the engineer (now realized to be one of industry's more valuable assets) can make his own career decision as he moves along. If he desires to get into management (because that is where the dollars are), he may. However, he has another route which if administered properly will afford him the same monetary position, but in the field of his own expertise. He becomes a specialist.

It was mentioned that one of the keys to the success of the ladder is its proper application. One of the most important factors is general knowledge of its existence. Once this has been done, the importance of the specialist must be emphasized almost over and above the manager's role. There should be press releases and publicity when the position is awarded and a continued effort to keep him visible, especially among his colleagues and peers thereafter. A constant effort must be made to make these specialists current with respect to company goals, progress, and how it involves him and his efforts. In other words, this is not an ivory tower position but an operational slot without irritation of managerial data.

This is the theory. How does it work? In a small survey it was as might be expected, some cases of great success and other cases where there were varying degrees of action. This variation seemed to depend on whether the double-ladder was being actively publicized and utilized at all levels. On the negative side, such comments as, "Well, they (management) still control our raises," and, "It's hard to pay top salary when no product is coming out the door". However, cases were found of scientists who went into management and requested transfer to the scientist's ladder, as they felt their real talents were not being put to proper use by their companies.

One unique case was of a scientist who refused to get on the management ladder because he knew where he could be of most value even though perhaps the company didn't. Through his resistance the double-ladder became much

GTE SYLVANIA - DUAL LADDER



more apparent to his colleagues, and results were extremely satisfactory.

Occasionally, an engineer is found who has worked into a so-called "patch" position. He is an outstanding scientist or engineer, a top-notch innovator, etc., but he also likes people, can relate well to them, can lead them, and likes to manage. This man is first a "workaholic", because it is obvious he is filling two positions, doing both well, and thoroughly enjoying his unique position which may have either a scientist or a manager's rating, but is in fact a hybrid of the two. This type must be recognized in any discussion of the scientist's position in the corporation, but he is a rarity.

In conclusion, the evolution of the engineer in industry has been traced, and a current solution, the "double-ladder" has been discussed. Although it cannot be regarded as a complete success, indications are that, if both sides accept and make every effort to utilize the approach, it does provide a very satisfactory solution.

Martha J. B. Thomas

Dr. Martha J. B. Thomas is currently the Manager of the Technical Assistance Laboratory at the Lighting Center, GTE Sylvania Incorporated, Danvers, Massachusetts. In this position, she is responsible for all the analytical services and technical assistance required by Sylvania Lighting Products' twenty-five plants, as well as for the Lighting Center itself. In addition, she has the responsibility for decisions as to the most appropriate techniques to be used in the various technical problems which arise. Thus, she serves as the liaison with GTE Laboratories in Waltham and any other laboratories which have services of help to the rapid solution of problems.

She received her undergraduate training at Radcliffe College, Class of 1945, graduating with honors, and her graduate training in chemistry at Boston University, M.A. in 1950, and Ph.D. in 1952 in physical chemistry. Upon receipt of her Ph.D. in 1952 she served as an instructor in the College of Continuing Education at Boston University from 1952 through 1968. Since joining Sylvania in 1945, Dr. Thomas has authored twenty-two technical papers largely in the field of inorganic chemistry and chemical processing and has been issued to date twenty patents. In recognition of her outstanding performance in the field of chemistry and chemical engineering, she received the 1965 Achievement Award from the Society of Women Engineers, the highest award presented by that Society. In 1966, she was selected by the American Academy of Achievement to receive "The Golden Plate," which is awarded annually to fifty outstanding Americans in all fields of expertise.

She is active in the following societies: American Chemical Society, Society of Women Engineers, Radcliffe Club, Electrochemical Society, Sigma Xi, and the Altrusa Club. She is listed in American Men of Science and Who's Who of American Women, Who's Who in Engineering, and the World Who's Who of Women.

In private life, Dr. Thomas is the wife of Dr. George R. Thomas and mother of four daughters.

MANAGEMENT VIEW FROM THE TOP

Dr. Dorthy M. Simon
Vice President, Research
Avco Corporation

INTRODUCTION

I was asked to discuss upward mobility of women, particularly women with technical backgrounds, from my point of view as a member of general management in a large industrial company. From my position as Vice President, Research at the corporate level, there are two directions to look—up to the top job, the chief executive officer, and down through other levels of management. Initially, I decided that it was more exciting to see what can be predicted at this time about women's chances to achieve that top spot in the future.

To do this I read a number of books and papers about the responsibilities, satisfactions and backgrounds of chief executive officers, papers on women's attainments as business managers and on the management styles they are developing. Then I cogitated on what the future holds and came to this conclusion: the star of women managers in business is rising. Why? Primarily because business is anticipating a terrible problem—a severe shortage of qualified managers in the years ahead. The feared shortage can be traced to the poor image of business held by the new generation. With more students entering professions and fewer studying business, where are the new managers to come from? It seems clear that today's managers have created the poor image of their field by using archaic methods of management which are exploitive and authoritarian and by valuing managers who have political acumen and the indiscriminate ability to knock out rivals high on the list for promotion while those with true leadership qualities, business expertise and integrity are rated low. The new generation brings to business a desire to be evaluated on what they as individuals have accomplished and an idealism of personal morality. They need "people-oriented" management. It is well documented that women are talented in developing and practicing successfully just this kind of behavioral based management. This talent and the predicted management crunch due to the disenchantment of the young with business are two factors which will expedite your upward mobility.

THE CHIEF EXECUTIVE JOB

Now to return to the chance to achieve the chief executive position, let us look at the truly unique aspect no other job in a corporation carries with it—the ultimate responsibility. According to the National Industrial Conference Board's analysis of the position[1], the chief executive officer is ultimately accountable to the company's owners and/or stockholders, employees, customers, the community and government for

Growth—financial performance
Character—reputation of the company
Perpetuation—company's capacity for self-renewal.

There are six essential responsibilities,[1,2] (1) to determine objectives and profit-making plans for the corporation, (2) to establish the basic organizational structure, including selecting key executives and developing a successor, (3) to control—to keep company performance to profit plans and maintain surveillance of key executives, (4) to formulate policies that establish the value system for the company based on one's own personal characteristics, such as integrity, deep thinking and commitment to hard work, (5) to maintain a good relationship with the board of directors, and (6) to maintain key external relationships with Government, the community, and stockholders which will enhance the corporate image.

In no other job does the character of the individual who holds it so completely mold its nature. This is true even though many parts of it can be delegated according to the desire of the one who holds it, although *accountability, leadership* and the *decision as to what to delegate* cannot be assigned. But can women find satisfaction in attaining such a position? It is reported that current chief executive officers[1] find satisfaction in three ways: achieving the top job, being counted among that group that shapes events, and, most of all, their sense of having made a creative and constructive contribution to their company and to society in general.

It is interesting to note that of the many stories that are told of male chauvinist actions, most of them strike at preventing the career woman from achieving these three satisfactions. For example, a woman is given a title which once designated a top job but the responsibilities that make it so and bring satisfaction to the person holding it are taken away when she is promoted to the position—thus producing the *token woman.* Or, a woman is appointed to a high-level, decision-making committee and immediately a subcommittee, omitting the woman, is set up and given the decision-making power the old committee had. She is cheated out of the satisfaction of being counted among that group that shapes events. Men seem to think women could find satisfaction in top positions or they wouldn't try so hard to keep them from doing so.

TECHNICAL BACKGROUND

On the surface, neither the functions of the chief executive officer nor the part of the job which cannot be delegated appears to rule out people with technical backgrounds or women.

In fact, many believe that the discipline required in obtaining and using a technical background, as well as the expertise it provides, is excellent training for the top job. A

technical background can be an advantage to gain the top spot, particularly in a technically-based industry. For example, according to *Forbes* article[3] which lsited the backgrounds of 822 chief executive officers, those with a technical background were fourth highest in number. People with finance, administration and legal backgrounds were higher, and marketing, sales and production lower. (See Table I.) Chief executive officers of 19 areas of industry had backgrounds in technology. (See Table II.) The largest number of CEO's with technical backgrounds headed utilities, next were companies dealing in natural resources and third were chemical companies. About one in ten chief executive officers has a technical background and some of their characteristics are listed in Table III.

WOMEN

No women were listed as chief executive officers in the *Forbes* article. However, Business Week[4] in their June 21, 1976 article entitled, "100 Top Corporate Women in America," listed eleven who appeared to classify as chief executive officers.

TABLE I.

CEO BACKGROUNDS.[3]

Backgrounds	Number	Percent
Finance	192	(23%)
Administration	175	(21%)
Legal	95	(11%)
Technical	75	(9%)
Marketing	56	(7%)
Sales	55	(7%)
Production	51	(6%)
Founder	44	(5%)
Operations	33	(4%)
Banking	22	(3%)
Journalism	2	
Insurance	2	
Retailing	3	
Investment	2	
International	1	
	822	

Of the eleven, nine were founders, co-founders or had husbands who had founded the organizations for which they now serve as chief executive officers. It is clear that, so far, while some women are serving in this capacity, few have made it by their prowess in upward mobility.

QUALITIES NEEDED

Historically, the chances of a woman becoming a chief executive officer are not good. But remember that those who have achieved this position now probably started their careers thirty years ago. The real question today is what chance do you who are just starting your careers have to attain that position? To evaluate that chance, we will look

TABLE II.

INDUSTRIES HAVING CEO's WITH TECHNICAL BACKGROUNDS.

Industry	No. of Companies
Aerospace	3
Airlines	1
Beer	1
Chemicals	7
Conglomerates	4
Construction	1
Container	1
Drugs	1
Electric, Electronics	5
Instruments	1
Leisure Time	1
Machinery	2
Metals & Mining	5
Natural Resources	12
Railroads	3
Service	1
Special Machinery	3
Tire & Rubber	1
Utilities	22
19 Areas of Industry	75 Comp.

at the qualities needed to climb the management ladder and then examine how women fare now as managers and how they should fare in the future.

What qualities do you need? According to John B. Miner[5] you must like to compete, like to exercise authority, have a favorable attitude towards those in authority in status positions (your boss and higher in the organization), have a strong sense of responsibility, and have a desire for a distinctive position.

Perhaps the last one needs further explanation. To me, this means that one must be able to believe that achieving the top job would bring you personal satisfaction.

How do these qualities required for top managers compare with the qualities women have demonstrated in conventional roles? Women have demonstrated favorable attitudes toward authority—just to get along well with husbands—and fathers (maybe too favorable), they have exhibited a strong sense of responsibility and have exercised authority in child rearing. Many have liked to compete in school for high grades. I think the charge that women are not competitive is untrue. It is difficult to be competitive when one does not receive approval for winning. It has often been observed that the support of a husband, a father, or a teacher in a woman's career endeavor reinforces her competitive spirit.

In addition, women are learning how to be successful—and to help each other. As Georgia Dullea reported recently in the *New York Times*[6], women are forming success teams to

TABLE III.

CEO's WITH TECHNICAL BACKGROUNDS.

Industries:	Largest number (22) head utilities; next are companies dealing in natural resources (12), third are chemical companies.	
Oldest:	Armand Hammer - 77 Occidental Petroleum	Named CEO at 70; with company 18 years
Youngest:	John D. Feehan - 46 Atlantic City Electric	Named CEO at 43; with company 23 years
Average Years With Co.:	25 years	
Average Age:	57.09 Years old	
Average Years as CEO:	5.77 years	
Average Salary:	$228,493.00	
Average Ranking (of Compensation)	405 (of 822)	

Birthplaces:

U.S. -	Northeast	20
	East	1
	Southeast	4
	South	7
	Midwest	23
	Southwest	7
	West	7
	Northwest	2
Other -	Canada	2
	Greece	1
	Russia	1
Total		75

help each other learn to win. The team is a replacement for a supportive family and provides a buddy, one particular member who may be called upon for advice or help whenever career problems arise. The system seems to be working. I am particularly happy to see that it is–because in 1972 when I was serving as Chairman of the Long Range Planning Committee, I suggested that the Society of Women Engineers should provide a similar kind of support for its members. The concensus then was that this was an idea whose time had not come. It is becoming recognized now that winning is a skill–that ambitious career women must learn how to be successful and to live with success.

Career women already have demonstrated many of the characteristics needed for success in business. Sandra Ekberg-Jordan[7] showed that women who are attracted to business reveal many of the same characteristics evident in existing male executives. The traits both groups reveal are strong communication skills, an ability to deal with people, and a drive toward accomplishment and recognition. Women also express interest in the opportunity to solve problems, to see results, and to use special talents. In addition to these characteristics, women in business need to develop management styles which will help them achieve the goals of the corporation through people.

MANAGEMENT STYLES

What kind of managers are women considered to be by today's management standards? According to Lyle and Ross[8] who compared men and women managers in respect to style, women used more innovative styles than men. One half used styles similar to men while the other half devised new styles labeled *Perceptive* or *Permissive* and *Detached* or *Undercontrolled.* While the men in this study used only two styles, Productive-Overcontrolled and Exploitive; the latter is not a style of management based on any of the theories of management. Managers using this method pay little

attention to administrative tasks and use their jobs as a stepping stone to a higher position. The authors defined the four styles as follows:

Productive-Overcontrolled Style—This is a highly task-oriented style. The manager knows little about the employees other than their work output. Subordinates find this style over-controlling, but predictable. They often feel emasculated by the style.

Exploitive Style—The managers using this style view their present jobs as launching pads to the next level in the management hierarchy. They are mainly concerned with their own visibility, gaining credit for success and looking good to their superiors. Their employees find themselves blamed for failures and, not infrequently, feel scapegoated.

Receptive or Permissive Style—Women are given the credit for inventing this style. These women are known as "good old girls." They are well liked, they see that the job gets done, and put a premium on keeping subordinates happy. They often delegate poorly; for example, they will help subordinates do a job in order to meet deadlines. Men, in dismay, call this a "female" style. Employees of female managers who use this style often turn down promotions and transfers because they believe that their boss cares about them personally as well as professionally. The special loyalty these women executives are able to secure from their people is the envy of their male counterparts.

Detached, Undercontrolled Style—The manager using this style delegates so well that the place is running itself. The form of administrative control is indirect and subtle. The detached manager is above the fray and is inaccessible. The manager's evaluation of employees places emphasis on their ability to solve their assigned work problems.

According to this study, published in 1973, almost all men use either the exploitive or the overcontrolled style—with three-fourths of the men using the exploitive style. One-half of the women, on the other hand, use the new styles—receptive and detached, while one-sixth use the exploitive style and one-third use the overcontrolled style. This study reinforces the premise used by many authors writing on women's management styles—women try harder than men to get the job done and done well. They are not just striving to move ahead in the organization.

Not only do women practice more experimental methods in management style than men, but they have also contributed much to modern scientific management theory. A recent article by Bette Ann Stead[9] documented the important contributions to behavioral management science that women such as Lillian Gilbreth, Mary Parker Follet, Jan Morton, Joan Woodard, Rene Poor and Christel Kammerer have made.

Professor McGregor many years ago set forth his theories of X and Y management which have become widely accepted; X being like the over-controlled style of management and Y being people-oriented (e.g. the receptive and detached styles described above). In the 1960's people-oriented styles became the subject of much discussion. Many studies including the one by Edward E. Dukes[10] have shown that managers using people-oriented techniques who believe that management is an ever-changing, ever dynamic system of interacting minds are beneficial to a company. In Dukes' example, under an X manager (by the book, overcontrolled) overtime ran just under two days per engineer per month while under a Y manager (people-oriented; participative and creative) overtime was reduced to one day per engineer per month, which is a 50% reduction, while at the same time the work load increased 14%. This represents an excellent increase in productivity which was attributed to management style alone.

The Y or people-oriented manager believes that being on the payroll is to accomplish realistic objectives and that the individual who is growing into a bigger and a more significant person makes a greater contribution than the one who is static. The Y manager's view of a well-run business is that it is no longer a static mechanistic, highly structural operation but is a fluid, dynamic and very responsive whole made up of people with interacting minds, rooted in a blend of corporate and individual purpose. It is this kind of manager who has a chance with young people who believe that business should serve the needs of employees, who expect organizations to offer opportunities for challenging and interesting work and for self-development and on-the-job growth, and who want to participate in important decisions which will affect them.

CONCLUSION

In conclusion, let me repeat that I believe the star of women in business management is rising. We are learning to cope with the old problems and we bring the necessary skill of participative management style to a new problem—that of motivating young people to undertake and continue careers in business. In the next decade, I believe there will be many more women chief executive officers of corporations and that they will have come through the ranks, propelled by their management skills, their self-confidence, and the magnetism of their personalities.

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Dorothy M. Simon

Dr. Dorothy M. Simon is Vice President, Research, for Avco Corporation, a 1.3 billion dollar conglomerate. In 1968, she was appointed the first woman corporate officer and is still the only woman among the 18 officers. Reporting directly to the President and the Chairman of the Board, she is responsible for guiding the research and development functions of the eight technology-based divisions to profitable growth for the Corporation.

Before joining Avco in 1956 as Principal Scientist and Technical Assistant to the President of the Research and Advanced Development Division, Dr. Simon had attained an international reputation in the field of Combustion. She was given a Rockefeller Public Service Award in 1952 for her research on laminar flame propagation and quenching which was carried out while she was with the Lewis Laboratory of NASA (then NACA). Previously, she had been a research scientist for the DuPont Company and for the Atomic Energy Commission (AEC).

Dr. Simon holds a Ph.D. from the University of Illinois, she completed a post-doctorate research Fellowship in physical chemistry at Cambridge, England under a Rockefeller award, and she was presented an Honorary Doctor of Science Degree by Worcester Polytechnic Institute (WPI).

Currently, she serves as a Trustee of WPI, a member of The National Science Foundation Panel for Science and Technology and a member of the MIT Visiting Committee for Sponsored Research.

She is a Fellow of The American Institute of Chemists, a member of the American Institute of Astronautics and Aeronautics, the American Chemical Society, The International Combustion Institute and Sigma Xi. She has received many honors, including the Society of Women Engineers' Achievement Award.

Left to right: Dr. David W. Day, Aileen Cavanagh (Session Director), Dr. George Odiorne, Robert Bennett

Left to right: Dr. Dorothy Simon, Dr. Lindon E. Saline, Phyllis Berger, Dr. Martha J.B. Thomas, Nancy Tafel, (Session Director)

JOB NEGOTIATION AND THE PRICE OF SUCCESS

Robert C. Bennett, Jr.
President
Bennett-Hill and Associates, Inc.

I will speak about the business and personal considerations of a person in developing one's career. We will discuss career paths and career plans. What do you want to do? Where do you want to go? Are you going to succeed or exceed? What price are you willing to pay to do it, and what reward, both financial and non-financial do you expect? Will your goals change?

One of the first points you should consider is the career path being offered you by a company. You should study and understand what type of company has made you the offer. Is it a growth company, is it stable, what are their prople policies, and what is their actual people record? What is their affirmative action commitment and record? Regarding affirmative action, what level have minorities and females achieved in the system? What is the company doing about women in management? What are they trying to do?

It is also important to know what the future health of the company's industry is, and what the company's place is in this atmosphere. It would be foolish for a good engineer to go to work for the best buggy whip manufacturer in the country, since the future of that industry is not too great.

In assessing a job offer, you should learn about the real management opportunities in the company. You should also determine what your real goals are. It may be that you wish to pursue a strictly professional and technical career, without management overtones. It is also possible that you may have an intense desire to be a member of management. You will want to know what the training opportunities are for you to be exposed to management learning. What is the promotion record in the company to management for females? The growth curve of the company is important. A company that is growing fast and in a healthy manner will have more management positions available for its people than a company that has leveled off in its growth. If you have a desire to be in management, you will need to assess your real management opportunities in the company.

The professional opportunities in the job should also be evaluated. You should determine whether your skills will be tested and improved. You should know what educational opportunities are available and what skill exposure you will have with peers and supervisors.

In negotiating for a position, you should recognize your own value as a person, a professional, and as a manager. You should also recognize your own faults. This evaluation of your strengths and weaknesses and your experience will help you realistically determine where you fit in an organization and will help you negotiate for the right level. You must be objective in your evaluation.

In your interview process, your attitude with the prospective employer is vital. Employers will be more interested in the individual, their experiences, their management ability or potential, and their goals than their professional qualifications.

Obviously they will expect a competent engineer, but they will concentrate heavily on these other qualifications. It is important in your interview to demonstrate that you are not a job-jumper going from company to company to rise in the corporate ladder. If you have changed jobs frequently, there must be presented a good reason for the changes. You must be realistic in your demands, but also must not devalue yourself as to money or responsibilities. It is important to give the impression that you are competent, bright, and interested in the position being discussed. Intelligent questions are welcomed, and in any interview, you should consider yourself as a respectful and interested equal to the interviewer. If you aren't accepted on this basis, forget that company. The question of your being considered an equal will come through to you in any interview.

We were asked to comment on the question of whether we see women starting at too low a level in business. We feel that this is less likely in moderately progressive companies needing talent. It is also less likely in the technical areas. Again, companies with a real affirmative action commitment and record will best place female and minority individuals on an equal basis.

It is important to avoid the trap of being advanced in title and salary without commensurate increases in professional responsibilities and real management responsibilities. We are aware of one company where individuals may reach a $35,000 level with the title of Manager, but with no real management or people responsibilities. These people tend to be trapped, since other companies are not very anxious to hire managers at $35,000 and higher who do not have management experience. It is also important to determine the breadth of management in a company. It is possible to go up a narrow tube from one management position to another, become an expert in one narrow field, without being broadened, learning other management skills.

We have also been asked to comment on employment contracts and whether or not an individual should ask for one. We have found that employment contracts are usually for top executives or for a person working for a specific term with a defined ending date. Most executives do not have contracts, and very few mid-management people have them. Most employers are turned off by the question. They feel that the need for a management contract demonstrates

a lack of confidence. Management contracts, however, can be a good device for spelling out complicated bonus questions for tax purposes, estate questions, and for providing legal protection for company related law suits.

On the question of liability of officers and directors, this is a time when everybody seems to be suing. Possible suits can come from stockholders, consumers, SEC, FTC, employee suits, and other governmental and regulatory agencies. Generally, the level of liability from a practical standpoint starts with an officer or director. We feel that any individual who is an officer or a director of a company should be protected by the company, by corporate resolution from such law suits. The company should pick up all costs and liability in the defense of such suits. It is very easy for a plaintiff to sue with an attorney on a contingency basis, and they can also sue for their legal fees. The defense, on the other hand, must pay attorneys for the defense, and cannot sue for legal fees. Such defenses can become very expensive.

What price will you pay to succeed or exceed? This again is part of the analysis of where you want to go and what you want to be. If you want to be the best, you will have to work hard, and sacrifice time and effort. You will have to give up other activities to be the highest achiever. The best athletes are the people who work hardest with some given talents. Why do people wish to exceed? They do it for financial rewards, personal satisfaction, and for the joy of winning. Some people do it for the same reason that they would climb a mountain. They conquer a problem or a mountain because it is there.

Bennett-Hill and Associates, Inc. is an executive search firm, with a number of offices in the United States. About fifty-five percent of our business is in the minority and female executive and professional area. As a search firm, we are hired by client companies to find specific people for specific positions. You may be interested to know what we look for in an individual. Obviously, we look for expertise in their field. We look for valid business experience. We look for real management experience and potential. We want to know one's ability to communicate, as well as deal with written and oral presentations. We are interested in the individual's goals and expectations. A candidate's intellectual and business curiosity is also of importance. We are interested in seeing the "whole person", and then matching these characteristics and background to the atmosphere of the client company.

In summary, employment has improved, and engineers are scarce. We suggest that you should know your real value, and the market for your talents in your own company and outside of your company.

If you have management goals, then you must get into management projects. We suggest you might get an M.B.A. You must make your interest in management known to your company. Management opportunities just don't happen to a person. Most importantly, recognize that now is your time–it's never been better.

Robert C. Bennett, Jr.

Robert C. Bennett attended Yale University where he was a member of BETA THETA PI, captain of the swimming team, and a holder of a world's record in swimming. He served in the Navy as an officer for three and one half years.

He has served as vice president in charge of sales and Executive Vice President of National Electric Products Corporation; as President of Wheatland Electric Products Corporation, Senior Vice President of Bell Intercontinental Corporation, an officer of Equity Corporation (an investment company which controlled Bell), Director of Pacific Industries, and as director or officer, of several small corporations for the last eight years.

Mr. Bennett has been President and owner of Bennett-Hill and Associates, Inc., a management consulting and executive search firm, since 1972. He is also President of Bennett-Hill-Sports which manages professional athletes.

As might be expected, his outside activities center around sports. He has been active as an officer of the United States Tennis Association and played on the United States Osuna Cup Team against Mexico in 1976.

ENGINEERS AND THE BUSINESS OF ENGINEERING

Dr. David W. Day
Vice President, Corporate Planning
Pneumo-Corporation

INTRODUCTION

(Slide 1) This morning, I want to speak about engineers and the business of engineering.

Slide 1

ENGINEERS
AND THE
BUSINESS OF ENGINEERING

Upward Mobility and
Professional Development for
Women Engineers
October 13, 1976
Easton, Maryland

At the outset, I would like to introduce the subject by posing the question: (Slide 2) What should an engineer know about strategic business planning? Most of the work of engineering is performed within the context of a business enterprise, and the work of engineering is interdependent with the work of other functions in the enterprise. To achieve upward mobility in the ranks of management, persons engaged in engineering should strive to see the enterprise as broadly as possible. I believe that the best way to achieve this understanding is to be able to grasp the strategy that a business is pursuing.

Slide 2

WHAT SHOULD
AN
ENGINEER
KNOW ABOUT
STRATEGIC BUSINESS PLANNING

(Slide 3) In trying to contribute to this understanding, I will be following the outline shown here.

Slide 3

TOPICAL OUTLINE

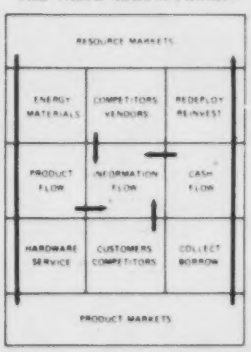
I. INTRODUCTION
II. CONCEPT OF A BUSINESS ENTERPRISE
III. CONCEPT OF BUSINESS STRATEGY
IV. ANALYTICAL TOOLS FOR STRATEGY FORMULATION
V. SUMMARY

CONCEPT OF A BUSINESS ENTERPRISE

With that as a background, let us take a look at a concept of a business enterprise which may be useful in understanding business strategy. (Slide 4) If you will focus on this illustration of the value-adding process, you will note that there are three principal flows depicted between the resource markets and the product markets. First, we have the product flow, which converts energy and materials into hardware and services to be consumed in the product markets. Revenues collected in the form of cash from consumers flow back to the resource markets in exchange for the values that have been added in the product flow. Within the economy there is a flow of information from vendors to producers to consumers. In a competitive economy, the various competitors in a given line of business share this information somewhat imperfectly and attempt to gain advantage through proprietary knowledge about resource markets and product markets. Obviously, the ability to gather and utilize information can be an extremely important part of success in the operation of a business.

Slide 4

THE VALUE ADDING PROCESS



49

(Slide 5) Having thus described something of the environment in which a business enterprise can be located, let us look at a definition of a business enterprise. This simple statement, "A business enterprise *occupies* and *operates within* a niche in the value-adding process" carries a great deal of meaning. The word *occupies* has been italicized to add emphasis to one of the basic concepts of business strategy. And as you will see, the emphasizing of *operates within* is also an extremely important concept.

Slide 5

DEFINITION OF A BUSINESS ENTERPRISE

A BUSINESS ENTERPRISE OCCUPIES AND OPERATES WITHIN A NICHE IN THE VALUE ADDING PROCESS

(Slide 6) A business has an occupational structure, which consists of its business posture, the niche that it occupies, and the capabilities possessed to plan, develop, and produce. At any given time, it has a certain position with respect to resource markets and customer markets through the products it currently offers. The niche it occupies is further defined by the business activities that it performs, the services that it purchases, and the influences that affect the activities of other participants in the business area.

Slide 6

OCCUPATIONAL STRUCTURE

BUSINESS POSTURE	MISSION, OBJECTIVES, POLICIES, STRATEGIES, PLANS, PROGRAMS; PROPRIETARY MOMENTUM
NICHE OCCUPIED	*POSITION WITH RESPECT TO*: • RESOURCE MARKETS • PRODUCTS OFFERED • CUSTOMER MARKETS; *BUSINESS ACTIVITIES*: • PERFORMED • PURCHASED • INFLUENCED
CAPABILITIES POSSESSED TO	PLAN, DEVELOP, PRODUCE

(Slide 7) The operational activities of a business consist of planning changes in its occupational structure, the rates of flow and storage of product, information, and cash, and the program relationships between changes in occupation and the level of operations. A business develops capabilities to plan, develop, produce, and operate. In the process it produces planned changes in structure, momentum, and program relationships. As we will see over time, a business enterprise has the capability to completely transform itself from one arena of activity into many others, reduce from many to fewer, or liquidate completely into an investment fund or a bankruptcy.

Slide 7

OPERATIONAL ACTIVITIES

PLANNING CHANGES IN	OCCUPATIONAL STRUCTURE, RATES OF FLOW & STORAGE, PROGRAM RELATIONSHIPS
DEVELOPING CAPABILITIES TO	PLAN, DEVELOP, PRODUCE, OPERATE
PRODUCING	*PLANNED RATES OF* PRODUCT, INFORMATION & CASH FLOW; *PLANNED LEVELS OF* INVENTORY, KNOWLEDGE & CAPABILITY; *PLANNED CHANGES IN* STRUCTURE, MOMENTUM, PROGRAM RELATIONSHIPS

(Slide 8) The flow and storage elements of a business enterprise take on a matrix in which the principal parameters are product, information, and cash. The output of hardware and service is regulated by the input of material, application of labor, and the wearing out of machinery. The corresponding storage elements of inventory, readiness of service, work force, and equipment are parts of the capability to serve customer needs.

The flow of information about environmental influences and competitive intelligence are vital to the operational direction of the enterprise. Measures of performance to gauge the effectiveness of operations are obviously needed. Finally, a stream of ideas to innovate and achieve competitive advantage is the wellspring of progress in the enterprise and the economy as a whole. Again, the corresponding stores of information, such as the reputation of the firm, the knowledgeability of personnel, and the appropriateness of rules, strategies, and plans affect the success of the enterprise.

Slide 8

FLOW & STORAGE ELEMENTS

	FLOW	STORE
PRODUCT	*OUTPUT* HARDWARE, SERVICE; *INPUT* MATERIAL, LABOR, DEPRECIATION	INVENTORY, READINESS; INVENTORY, WORK FORCE, EQUIPMENT
INFORMATION	*ENVIRONMENTAL* INFLUENCE, INTELLIGENCE; *OPERATIONAL* DIRECTIONS, MEASURES, IDEAS	REPUTATION, KNOWLEDGE; RULES, STRATEGIES, PLANS
CASH	REVENUE, EXPENDITURES	NET WORTH, CASH-CREDIT

Finally, the flow of cash is the ultimate determinant of success in business. Many seemingly brilliant business operators and innovators have run aground when their expenditures have exceeded their revenues over too long a period of time, creating a negative net worth, and leaving them without the availability of credit to sustain their operations.

(Slide 9) If you look at the overall operation of a business as a complex program of decision areas, you need to integrate some sequence of *operating* actions with some set of occupational objectives. Therein lies the basic problem of the management of an enterprise. To achieve upward mobility in the ranks of management, it behooves us to understand the problem for which we strive to provide a solution.

Slide 9

PROGRAM DECISION AREAS

PROGRAMMING OPERATIONAL ACTIONS	PRODUCING DEVELOPING PLANNING
PROGRAMMING STRUCTURAL CHANGES IN	CAPABILITIES NICHE OCCUPIED BUSINESS POSTURE
PROGRAM INTEGRATION	OPERATING ACTIONS OCCUPATIONAL OBJECTIVES

(Slide 10) Our outline continues to a—

Slide 10

TOPICAL OUTLINE

I. INTRODUCTION
II. CONCEPT OF A BUSINESS ENTERPRISE
III. CONCEPT OF BUSINESS STRATEGY
IV. ANALYTICAL TOOLS FOR STRATEGY FORMULATION
V. SUMMARY

CONCEPT OF BUSINESS STRATEGY

(Slide 11) The principal message in this presentation is contained in the following definition of business strategy:

> "Business strategy is that governing concept of how a business intends to occupy and operate within a selected niche in the value-adding process to achieve desired business objectives under the changing conditions of competitive business environment."

There are many variables in the conduct of a business, and it is often difficult to sort out the everyday demands and focus on the major moves that a business needs to make.

Slide 11

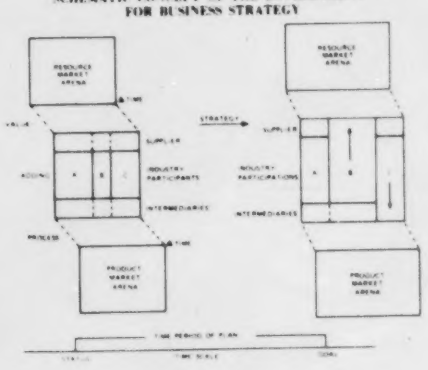
DEFINITION OF BUSINESS STRATEGY

BUSINESS STRATEGY IS THAT GOVERNING CONCEPT OF HOW A BUSINESS INTENDS TO OCCUPY AND OPERATE WITHIN A SE LECTED NICHE IN THE VALUE ADDING PROCESS TO ACHIEVE DESIRED BUSINESS OBJECTIVES UNDER THE CHANGING CON DITIONS OF COMPETITIVE BUSINESS ENVIRONMENT

(Slide 12) There are many choices that can be made in the formulation of a business strategy. The schematic concept of the environment for business strategy shown here focuses upon decisions to integrate vertically to achieve advantage over time in the product market arenas. As we see here, we have industry participants A, B, and C operating in the value-adding process between suppliers and intermediaries. When we look at the participants at a later time, we find that the overall market has grown and that the participants have shared in that growth in different ways. Participant *A* apparently chose to continue business as usual, and while losing market share, *A* did manage to sustain the previous level of operation. Participant *B* chose a strategy of vertical integration to better control the source of supply, and as a consequence was able to dramatically increase both the share of business and the level of business obtained. Participant *C* chose to integrate vertically toward the customer and in this case did not significantly increase share of market but did occupy a new position in the value-adding process.

Slide 12

SCHEMATIC CONCEPT OF THE ENVIRONMENT FOR BUSINESS STRATEGY



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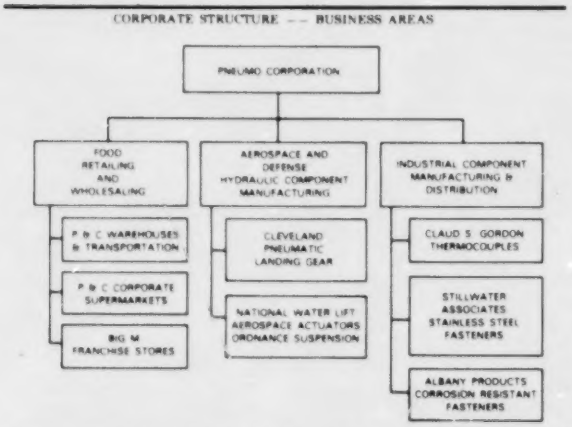
(Slide 13) There are several levels of strategy to be chosen by the managers of a business enterprise. To illustrate by example, I would like to describe the corporate structure of the Pneumo Corporation, with which I am associated. Pneumo Common Stock is traded on the New York Stock Exchange, and its corporate office provides treasury and control functions for several divisions and subsidiaries. These divisions and subsidiaries operate in diverse business areas as part of a deliberate strategy to dampen periodic business cycles. The strategy of corporate diversity has been applied here to take advantage of stability in cash flow.

Within each of the principal lines of business, there is another level of strategy which is more directly concerned with the contest against competitors serving specific classes of customers. In brief, I am saying that strategic plans for a business enterprise have to be built up in layers from the various business areas in which the corporate enterprise operates, but in turn there is a corporate level of strategy which determines the business areas to enter, emphasize, or abandon.

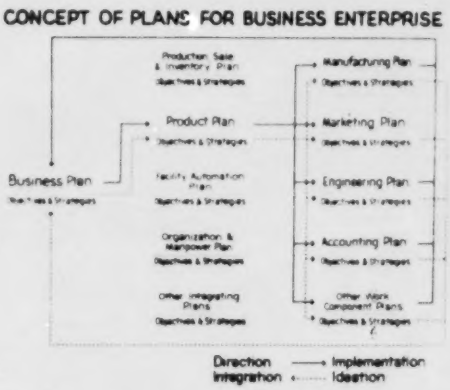
Slide 13


CORPORATE STRUCTURE -- BUSINESS AREAS
PNEUMO CORPORATION
FOOD RETAILING AND WHOLESALING
AEROSPACE AND DEFENSE HYDRAULIC COMPONENT MANUFACTURING
INDUSTRIAL COMPONENT MANUFACTURING & DISTRIBUTION
P & C WAREHOUSES & TRANSPORTATION
P & C CORPORATE SUPERMARKETS
BIG M FRANCHISE STORES
CLEVELAND PNEUMATIC LANDING GEAR
NATIONAL WATER LIFT AEROSPACE ACTUATORS ORDNANCE SUSPENSION
CLAUD S GORDON THERMOCOUPLES
STILLWATER ASSOCIATES STAINLESS STEEL FASTENERS
ALBANY PRODUCTS CORROSION RESISTANT FASTENERS

As an example, if we look at the Claud S. Gordon subsidiary of Pneumo Corporation, which produces thermocouples and thermocouple wire, we find an entity that uses a concept of plans for its business similar to the one shown here. (Slide 14) On the right hand side, we see the usual functional work plans laid out the way a business of that type is organized. In between the business plan and the functional work plans are the integrating plans that concern themselves with the prime issues that are shared by the various functions in the business. In this view graph, I have highlighted the product plan and will come back to talk about that in greater detail in the next section of this presentation.

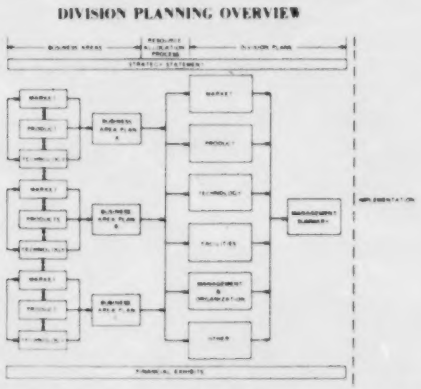
In addition to Claud S. Gordon, Pneumo Corporation has two other entities in the industrial division, "Stillwater Associates", a manufacturer of stainless steel fasteners, and "Albany Products Company", a distributor of corrosion-resistant fasteners. From a divisional viewpoint, plans are developed for each of those business areas as shown (Slide 15) in this division planning overview. Here the focus is on the business area plans A, B, and C, which are then

Slide 14



summarized into the overall division plan for incorporation into a corporate plan. It is rather easy to combine the financial exhibits of these various businesses, but it is more difficult to combine the business strategies of these diverse entities in the overall corporate plan. As you will note, however, a strategy statement is called for to pull together the principal activities of the industrial division.

Slide 15



(Slide 16) We have touched on the subject of plans and of strategies, and I would like now to state the purpose of a strategy statement.

"The purpose of a strategy statement is to succinctly express the integrating theme of the business plan. In this sense it is both the outline from which the plan is developed and an abstract of the developed plan. Its primary use is to convey an understanding of the way in which the plan will accomplish objectives to higher and lower levels of management as well as among managers at the same level.

In a going business, many of the resource play activities will be expressed or understood in "charter" and/or "policy" form, thus making it possible to abbreviate and restrict the strategy statement to those exceptional or

critical changes in the on-going allocation and plan of resource. Hence, a most satisfactory statement can be tersely expressed. When a new business is being entered or a new management is taking over the operation of a business, the strategy statement might need to be expanded to cover on-going elements as well as the exceptional items."

Slide 16

PURPOSE OF A STRATEGY STATEMENT

The purpose of a strategy statement is to succinctly express the integrating theme of the business plan. In this sense it is both the outline from which the plan is developed and an abstract of the developed plan. Its primary use is to convey an understanding of the way in which the plan will accomplish objectives to higher and lower levels of management as well as among managers at the same level.

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(Slide 17) With this purpose in mind, we see here the outline of a strategy statement which can summarize quite succinctly the essence of an enterprise. As you can see, there is a section to describe the occupational position or business charter of the entity for which a statement is being prepared. There is a section that summarizes the operating objectives for the business segment or corporate entity to which the plan applies. There is a section for describing the business area strategies within the entity as a whole and a section for delineating key result area objectives, present and future, which have a critical effect upon the patronage, permissibility, perpetuity, and profitability of the enterprise. Finally, of course, there is the opportunity to draw this all together in paragraph form as a distillation of major thrusts to be pursued by the business.

Slide 17

STRATEGY STATEMENT OUTLINE
CORPORATE/DIVISIONAL

A OCCUPATIONAL POSITION — BUSINESS CHARTER
- — Present Business Areas
  - Products, Markets, Customers, Suppliers, Competitors
- — Exploratory Business Areas
  - Products, Markets, Customers, Suppliers, Competitors
- — Critical Relationships
  - Organizational, Financial, Regulatory

B OPERATING OBJECTIVES AND EQUITY STATUS
- — General Statement — Fiscal Years
  - $ Millions or Ratio: 1972 1976 1977 1978 1982
- — Total Sales Billed
  - Business Area 1
  - Business Area N
- — Earnings Contribution
  - Business Area 1
  - Business Area N
- — Net Assets Employed
- — Cash Flow
- — Return on Sales
- — Return on Net Assets

* Earnings per Share
* Book Value per Share
* Debt to Equity Ratio

C BUSINESS AREA STRATEGIES
- — For Each Area — — Present and Exploratory
  - Market and Customer Analysis
  - Competitive Analysis
  - Supplier & Regulatory Assumptions
  - Major Product/Program-Actions
  - Earnings Impact Analysis
  - Summary Business Area Strategy

D KEY RESULT AREA OBJECTIVES — — PRESENT/FUTURES
- Market Management
- Margin Management
- Expense Management
- Asset Management
- Product Management
- Process Management
- Personnel Management
- Information Management
- Profit Management
- Equity Management
- Public Responsibility
- Professional Management

E SUMMARY CORPORATE/DIVISION STRATEGY
- — Within the charter area, operating objectives will be achieved, with supplier and customer cooperation, against competition, within these explicit constraints, through these major thrusts.

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(Slide 18) I would like to come back to the key result area objectives and expand that a little bit as shown here. Without going into each of these key result areas, let me state that it is a practical thing to establish present measures of these performance factors, future measures to be achieved at some period of time, and statements of the development activities needed to achieve those objectives.

Slide 18

KEY RESULT AREA OBJECTIVES
SIGNIFICANT MEASURES AND FACTORS

	PM	FM	DA
MARKET MANAGEMENT			
Volume of Sales Orders			
Share of Market			
Customer Attitudes			
MARGIN MANAGEMENT			
Volume of Gross Margin Dollars			
Competitive Price Position			
Competitive Cost of Material Position			
EXPENSE MANAGEMENT			
Total Operating Cost Dollars			
Percent of Sales Dollars			
Percent of Margin Dollars			
ASSET MANAGEMENT			
Inventory Turnover			
Days Outstanding Accounts Receivable			
Accounts Payable as % of Inventory			
PRODUCT MANAGEMENT			
Customer Benefit Rating			
Product Cost Rank			
Product Technology Status			
PROCESS MANAGEMENT			
Production Capacity			
Productivity of Plants			
Process Technology Status			

	PM	FM	DA
PERSONNEL MANAGEMENT			
Employee Competence			
Employee Attitudes			
Productivity of People			
INFORMATION MANAGEMENT			
Hardware Capacity			
Software Efficiency			
Productivity of Information			
PROFIT MANAGEMENT			
Total Dollar Earnings			
Return on Sales			
Return on Assets			
EQUITY MANAGEMENT			
Cash Flow			
Debt to Equity Ratio			
Book Value per Share			
PUBLIC RESPONSIBILITY			
Consumer Protection			
Employee Health & Safety			
Environmental Protection			
PROFESSIONAL MANAGEMENT			
Managerial Leadership			
Strategic Planning			
Investor Stewardship			

(Slide 19) Our outline continues with a look at–

Slide 19

TOPICAL OUTLINE

I. INTRODUCTION

II. CONCEPT OF A BUSINESS ENTERPRISE

III. CONCEPT OF BUSINESS STRATEGY

IV. ANALYTICAL TOOLS FOR STRATEGY FORMULATION

V. SUMMARY

Slide 20

ANALYTICAL TOOLS FOR STRATEGY FORMULATION

At this point I would like to display some analytical tools that can be used for strategy formulation. As I mentioned before, the product plan or (Slide 20) the concept of the product offering to be made by a business is one of its most important decision areas. All revenues are derived from customers whose views of the value of satisfactions gained determine whether they select your product or that of a competitor. This view might be termed the product image projected by your brand at your price level, which can be a degree of franchise with the buyer. On the other side of this mirror image is the product concept as conceived by the business in terms of cost factors and profit opportunity to provide a vehicle for business operation.

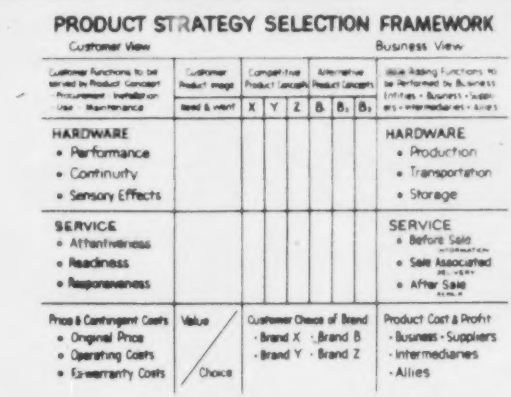
Please keep the ideas of product image and product concept in mind as we look at this matrix (Slide 21) of possible product market objectives which any business can choose. In the near lower left hand corner of the matrix is a square that says, "Make No Change." In other words, maintain market status, maintain product status. In this case, the image from the customer and the concept from the producer is not changed. But this is a most unusual circumstance, because in our dynamic, competitive economy, changes are induced from the external sources which cry for change. The fact is that without planned changes a business will very likely move further to the left hand corner, abandon the market, and withdraw its product because competitive products will take away the market. Without belaboring each of the sections of this matrix, I would like to jump to the upper right hand corner, where we have the situation of the entirely new venture. Here a new market is being developed, and new technologies are being employed to develop that market. This is an exciting area, but it is one having very high risk. To some degree, the success of Xerox fits this square, but it is equally true that there are thousands of other ideas which did not result in financial success.

Slide 21

(Slide 22) In the development of a product strategy, the selection framework shown here has proven to be useful. On the left hand side we have the customer view, and on the right hand side the business view. Customer needs and wants are projected in requirement terms. Available competitive product concepts, X, Y, and Z are analyzed in terms of those customer needs and wants. The product planner then has the opportunity to project alternative concepts B1, B2, and B3 as candidates for winning a satisfactory share of the market involved. In selecting an alternative, the achievement of cost leadership is a key to winning market share at profitable levels of growth.

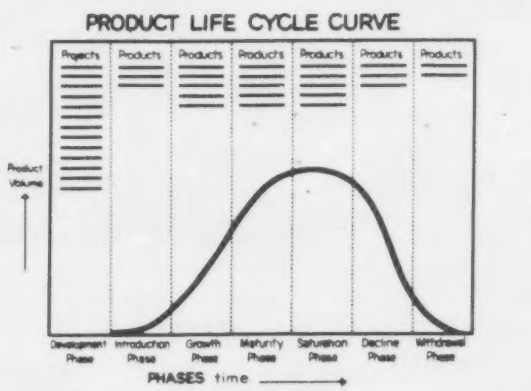
(Slide 23) The product plan is constantly evolving, because customers and competitors are constantly changing in terms of their wants and needs and their abilities to provide products of ever-increasing attractiveness. As a consequence, products have a definite life cycle, which ranges from the early development phase to the ultimate withdrawal from

Slide 22



the marketplace. The successful product grows in sales, achieves a saturation point, and then declines. New product development projects need to be carried along to keep filling the pipeline with new and revised products that will maintain and expand the product line of the business. A quantity of projects in development need to be maintained if selected products are to meet product volume goals.

Slide 23

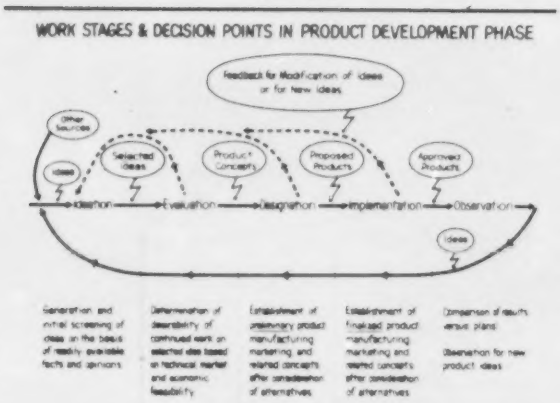


(Slide 24) As many of you know, the path of an idea to successful fruition is beset with many barriers. This diagram of work stages and decision points in product development is only a simplistic summary of the kind of iteration required to develop a successful product.

What I have been talking about in this phase has to do primarily with the development of individual products or product families to provide product flow in the business enterprise. Another level of consideration is to evaluate a portfolio of *business areas* within the corporate structure.

(Slide 25) The next matrix which you will see may create a cartoon atmosphere, but it is one of the most powerful ideas for business evaluation. This growth share matrix is based upon the two factors of growth rate and market share enjoyed. Numerous studies have validated the truism that

Slide 24


WORK STAGES & DECISION POINTS IN PRODUCT DEVELOPMENT PHASE
Feedback for Modification of Ideas or for New Ideas
Other Sources
Ideas
Selected Ideas
Product Concepts
Proposed Products
Approved Products
Idea Generation
Evaluation
Design Action
Implementation
Observation
Ideas
Generation and initial screening of ideas on the basis of readily available facts and opinions
Determination of desirability of continued work on selected idea based on technical, market and economic feasibility
Establishment of preliminary product manufacturing, marketing and related concepts after consideration of alternatives
Establishment of finalized product manufacturing, marketing and related concepts after consideration of alternatives
Comparison of results versus plans
Observation for new product ideas

the attainment of a predominant market share carries with it many competitive advantages. It is equally true that large gains in earnings usually come from business areas that enjoy a rapid growth rate.

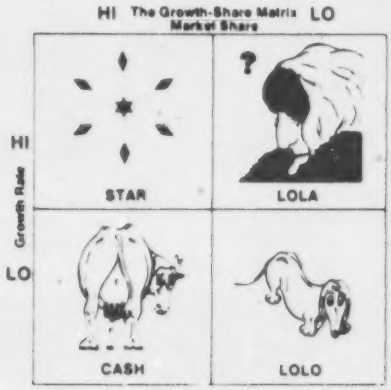
If we focus on the upper left hand quadrant of the matrix, we will note that a business area with a high growth rate and a high market share is classified as a star performer. This type of performer, while generating rapidly-growing earnings, is also likely to be a large user of cash flow. Without some of the other types of business areas in your portfolio, the star type of business may be difficult to finance.

If we now focus on the lower left hand quadrant of the matrix, we find a classification of business areas that have a low growth rate but which have a high market share. In business analysis terms, this is known as a cash cow. It is the type of business which can contribute excess quantities of cash flow to support the demands of star performers that you may have in your portfolio.

Moving to the lower right hand quadrant, we have a classification in which the business area has a low growth rate and a low market share. This section of the matrix is affectionately known as the kennel club, and the occupant here has been named LoLo. Business areas of this type are usually a drag on the corporate operation by absorbing a great deal of management attention to avoid losing money, while at the same time they lock up cash that might be used more appropriately in other ventures. Business areas of this type are the most likely to be abandoned by an aggressive management.

In the upper right hand quadrant, we have the mystique of the growth share matrix. Here the business areas have a high growth rate but the corporate entity enjoys a low market share. This is a situation where the question of position on the growth curve becomes extremely vital. By the way, if you have not noticed, there is an optical illusion in the upper right hand quadrant. Looked at one way, you see the face of a young lady, dressed in high fashion; looked at another way, you see the face of an older lady, who has suffered from aging. The question for any LoLa business area becomes—is she young or is she old?

Slide 25



(Slide 26) To elaborate on the growth curve question, we need to take a look at the curve of volume versus time, which is shown here. Despite having a low market share, if the business area is young and is just beginning its sharp rise of growth, as depicted in the lower left hand corner, there is a very good opportunity to gain market share and create a star performer for the business portfolio. If the business area growth is as depicted by the arrow near the center of the graph, the question remains whether the growth will continue for some time in the future or whether it will saturate and decline in the near term. If the latter happens, the business area is likely to fall into the Low-Low category.

The subjects that I have been discussing in this section on strategy formulation can only be addressed in a superficial fashion, but I hope that this has given you some perspective not conveyed in the dry terms of principles of economics.

Slide 26

SUMMARY

To summarize my remarks this morning about engineers and the business of engineering, I would make the following points: (Slide 27)

- Engineering creates and draws from science and technology to develop products and processes for business.
- Engineering work is dynamic in a competitive business environment.
- Understanding the business environment is important to personal career progress.

Slide 27

SUMMARY

ENGINEERS AND THE BUSINESS OF ENGINEERING

- ENGINEERING CREATES AND DRAWS FROM SCIENCE AND TECHNOLOGY TO DEVELOP PRODUCTS AND PROCESSES FOR BUSINESS
- ENGINEERING WORK IS DYNAMIC IN A COMPETITIVE BUSINESS ENVIRONMENT
- UNDERSTANDING THE BUSINESS ENVIRONMENT IS IMPORTANT TO PERSONAL CAREER PROGRESS

BIBLIOGRAPHY

1. Ideas in Slide 21 were drawn from a similar matrix by Booz Allen Hamilton.
2. Ideas in Slides 25 and 26 were drawn from similar illustrations by The Boston Consulting Group.
3. Many of the ideas contained in the presentation were developed while working for General Electric Company, Rockwell International, Arizona State University, and Pneumo Corporation.

David W. Day

Dr. David W. Day is currently vice president, corporate planning and services for Pneumo Corporation, Boston. Pneumo is listed on the New York Stock Exchange and is a leading designer and manufacturer of aircraft landing gear, flight control and other industrial products and a major food retailer and wholesaler.

Before joining Pneumo in June of 1975, Dr. Day was an associate professor of management at Arizona State in Tempe. Dr. Day was vice president, business development and product planning for the Collins Radio Group of Rockwell International in 1974 and vice president, corporate development for Collins Radio from 1972–1974. Before this he was chairman and chief executive officer of American Data Systems from 1971–1972.

In 1970-1971 Dr. Day was vice president of new business development at North American Rockwell and from 1968 to 1970 he was vice president and general manager, medical group for Picker Corporation, coming to them from the General Electric Company where he was manager of marketing, medical x-ray. Prior to this he spent sixteen years with General Electric in various business planning and marketing positions.

Dr. Day graduated from the University of Minnesota with a bachelor's degree in electrical engineering. He received his master of arts in marketing and his doctorate in general business from the University of Iowa. Dr. and Mrs. Day have four sons and currently reside in Boston.

Summary of Presentation–"THE TROUBLE WITH ENGINEERS"

George S. Odiorne
Dean, School of Business
University of Massachusetts

Engineering is a turbulent profession these days. The evidence here isn't too hard to find. People don't trust engineers as they once did. Every technical issue is now the subject of a new mode of technical decision making–the ballot box. In California and elsewhere, technical issues of some complexity are now subject to popular votes, as if the truth were a commonly held opinion.

For another thing, the supply and demand for engineers has a very mercurial history. After Sputnik we pledged to produce more than the Russians. After the decline of aerospace in 1972, great surpluses occurred and unemployed engineers were everywhere.

Still further, it becomes apparent that keeping technically abreast of all of the changes which arise makes many engineers obsolete. It often seens easier and more economical to hire a fresh graduate than to retain the experienced old hand who has gravitated to the top of the salary range.

Yet these are perhaps symptomatic of some deeper problems in the way your nation manages this high talent group.

What is an engineer?

Many people in engineering are really clear on who they are, which is of course true of society generally, with respect to identifying what an engineer is.

1. The Freshman definition. In engineering school, they tell freshmen that engineering is a profession which converts the principles of science into beautiful and useful objects for the benefits of mankind. That is a noble ideal, and many engineers behave for a long time afterward as if that were widely accepted.

2. The scientist definition. Yet the physicist, the chemist, the mathematician and the biologist often see the engineer as something less noble. A hearty, practical and somewhat occupational person who struts about pretending to be a scientist. In the order of science, the engineer, as an applier of knowledge, ranks at the bottom of a hierarchy in which the creation of knowledge ranks highest of all.

3. The manager's definition. As custodian of a whole host of responsibilities, including financial marketing, personnel, government and legal obligations as well as technical, management sees the engineer as but one of a series of specialists who are paid to be hired brain boxes. Drop in a problem and out should come an answer and a gadget on time and within budget.

4. The environmentalist's definition. To the environmentalist, the engineer is too often identified with the despoilers and polluters of the world. They have built the smelters, the refineries, and the cars which despoil our air, our water and our hearing.

5. The public definition. The public is presently ambivalent. It vacillates from one idea to another about the engineer, his or her work, and his or her reliability. Ten or twenty years ago they believed engineers who enthused about the peaceful uses of atomic energy. Today, they follow another group of engineers who suggest that nuclear power will kill us all; if not at once, then slowly through degenerative pollution. They observe the engineers tearing each other's ideas to shreds, and wonder at whether or not such people really have their act together.

6. The engineer's definition. The engineer sees himself mainly as a professional. In that role, the engineer stands delicately poised between the wholly minded scientists on one hand and the fuzzy minded and confused public at large. The engineering mind, it is suggested, has a monopoly on logic, and "technical competence" is something which can deal with all problems. Like ketchup in a college dining hall, it is a universal solvent for all problems.

WHAT ARE THE CAREER OPPORTUNITIES IN ENGINEERING?

Yet, the fascination and satisfactions in engineering continue to attract people, and increasingly, women. What are its attractions as a career?

1. The career engineer. For many it consists of looking forward to a lifetime of engineering work, converting theory into tools, systems, hardware, bridges, and armor. The output would be a stream of useful and beautiful products and services which will benefit humanity.

2. For some, this career will be as an independent consulting engineer, being a small business person, a self employed professional, owner of one's own business and controller of one's own destiny. This opportunity continues to attract many.

3. As an employed professional. Many seek jobs in the engineering department of a large firm or government agency as a well paid employee, gaining status and rank according to one's experience and achievement. This

opportunity today seems to be the most available to women engineers, for large firms have affirmative action pressures to bring more women into such positions, and more women are responding.

4. Engineering as a road to management. A significantly large number of engineers, both men and women, see the route to the executive suite through engineering. The knowledge of products, the ability to think rationally, and the objectivity and high standards of engineering have proven to be a source of management talent for many firms. The ranks of top management are replete with former engineers, a fact which is noted by many younger engineers who merely work at engineering as an apprenticeship until the call comes to abandon it for the manager's desk.

5. Engineering as a base for a business. Many engineers combine technical development skills with enterprise and form their own firms to make and sell the products they have invented or developed. Polaroid, Digital Equipment and hundreds of other firms were started by engineers armed only with their brains and a new idea which they exploited to become owner president of a sizeable firm and considerable wealth.

Making a career choice among these isn't all that easy, and you may try your hand at one before electing another.

HOW DO PEOPLE GET AHEAD?

Finally, in making such choices, there seems to be some experience based guides to "making it" in the world of technology and business.

1. Have a goal. Most people who are high achievers, states David McClelland of Harvard, start with some clear goals in mind. If you don't know where you are going, then any road will get you there.

2. Get committed. People who have goals don't always achieve them, for many goals are wishful dreams or hopes unfulfilled. The people who achieve their goals seem to be more committed to those goals than those who fail. While some luck is present, the commitment, whole hearted, full tilt, setting aside other goals and pleasures appears to have a direct relationship to the frequency of attainment.

3. Renew yourself always. People who engage in technical work can readily become obsolete, and a steady commitment to self renewal and retreading is necessary to avoid technical and personal obsolence.

4. Picking good bosses. One of the keys to success in organization has clearly been attached to the ability of people to find good bosses and helping them succeed, and in turn, being assisted in their career. This has been sometimes known as the "old boy" system, which of course presents an important problem to women engineers. Finding a successful higher level person today means finding a predominantly male population to choose from. The scarcity of higher ranking women in engineering makes such a system rather difficult for many engineers, for the traditional modes of thinking still dominate.

The gist of this paper? Figure out who you are, pick a career path with appropriate alternatives, and make the proper steps which proven careerists have followed.

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REVEALING THE HIDDEN CURRICULUM OF PROFESSIONAL CAREERING

Adele M. Scheele, Ph.D.
Vice President
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I'm really glad to be able to participate with you this past week and to get a chance to speak with you this morning, to give you some information from my research that you can think of as a grid to lay over your experiences here. While it's profitable to share and support one another, as one of the objectives of coming together in a conferencing process would be, and that support is vital; another objective is clearly to learn something so that you can go back and expand and enrich your own specific jobs and learn to take different kinds of opportunities no matter where you are, whether you're coming into engineering as a new entry person, whether you are changing from technical to management, or whether this is maybe the crest of your career and you would like opportunities to enrich that and to share, in fact to teach -play mentor- to other women. No matter where you are, there are skills that you can learn to enhance your position so that you can feel great satisfaction and, at the same time, enhance the position of so many others within your organization -using this support network that extends across the country.

I have been asked this morning to talk about some of the research that we at Social Engineering have been doing about careers, about career development, and rethinking the meaning of career from the specific jobness that we often give it to progress through life--the dictionary's first definition.

I'd like to talk about what we've been calling Critical Career Competences which are those things that successful people have acquired and use, whether they are conscious of them or not. These Critical Career Competences are skills that make a difference in what people pay attention to and what they think to do. They are demonstrated in successful interaction in dealings with people but they appear as the result of casual fortuitous circumstances in the course of everyday situations. These Critical Competences are a class of skills very different from the substantive or the technical skills that you know about as part of your profession of engineering. These skills that I'm talking about are apart from knowledge of the field or even the willingness to work hard. For the most part these Critical Career Competences are acquired along the way and because of their everydayness, they've been very largely ignored in professional training. I would doubt that any of you have even heard of them in engineering school. They are generally not discovered but if they are, they are passed on as advice. They come in our folk wisdom, for example, on how to succeed. People say "it's who you know, not what you know," "it's being at the right place at the right time," and "it's success that breeds success."

What my research has been in the past year is to try to translate these sayings: What do they mean and how can we apply them to ourselves so that we can be the right people at the right time and have the connections that we want? I started on it in a presentation to a graduate seminar for education administrators and I wanted to demonstrate what these critical career skills were with regard to careering.

I began by asking students how they would find jobs after graduation. Their answers shocked me. Their responses were: go to the placement office or ask "favorite professors for tips." When I asked them how they would design a national training program to sustain young adults during a national depression, they could only think of tutoring ghetto children in reading. When I asked them what advice they would give to their recently unemployed stockbroker brother, choosing something out of my hat, again they said "go to the placement office," or worse, they said "go to the unemployment office." What these responses, such as going to the placement office, going to the unemployment office, suggested to me was a very low level understanding of the way people get jobs or what training people think they need about getting them. These answers are stock, institutional answers that reveal behind them a passivity and a dependence on a system that will only disappoint people. And you engineers know, more than anybody, that security in jobs is not guaranteed, that one profession does not prevail, and you have lived during a time when promised professions have turned.

What makes successful careering? At one extreme, life can be viewed as a system of tricks and ploys and any means is justified for getting ahead, if you're not found out. It taints making it with opportunistic hustling and using others as manipulative instruments. At this extreme, life is explained as a game. At the other extreme, only hard work and correct answers count. Independence is required. Knowledge presages success. This is the version academe presents and that most organizations offer up as a good model; but both extremes--one, life is a game, and two, life is a test--are stereotyped views of the roads to success and both are equally unrealistic. Sooner or later you know that the hustlers lose and you also know that the good students are left behind.

One of the current problems in successful careering is finding some kind of behavior which will permit us to have the working lives that we want. Success, as it looks now, is not only culturally defined, that is money and status, but also personally defined (satisfaction, peace of mind, comparative values, work itself). What I've researched is an

inquiry into careering, the process of moving and growing not only within one's actual job but also within a series of jobs that constitute a productive life. Career means progress of life, according to the first definition, as I said, yet ambiguity occurs within the term itself. In addition to meaning life's trajectory, career also connotes the itness, the specific, the status weighted job and by using the word careering I mean to imply whole process rather than the thing.

Careering includes a repertoire of known behaviors that is situationally responsive approaches, retreats, gambits, viewpoints, experiments, ventures—these behavioral skills are quite apart from the factual content of careers but apparently are valuable to a successful negotiation of everyday actions and transactions that move us in careers. I have studied the career lives of very successful professional people in order to determine what it is that they do and I have been satisfied because my work in life planning and career development within Social Engineering Technology suggests to me that Critical Career Competences are derived from a sense of personal power and a willingness to experiment with situations. People who possess these critical competences view themselves as happening to things rather than being the ones that things happen to. What I've done, therefore, is try to identify—to discover, to characterize—what these competences are because if they can be identified, then they can be taught.

Typically, these Critical Career Competences represent what might be termed the hidden curriculum. They are learned from mentors, gleaned from experience, and discovered by accident. Rather than just name the skills that I've identified I thought we might together begin to explore our own lives. Not as studies about a motivational field of engineering and not about testimonies about success, so I'm not giving you a definition of success with how-to steps but rather I thought we might make accounts of our lives so that they can be read as phenomena about the framing of experiences and the making of opportunities. Not even just within the career field of engineering but also in other pursuits so that what you do with me now in mapping your own lives might reveal the hidden curriculum that's always taken for granted in the process of careering. So what you as engineers do as young women in elementary, junior and senior high school, and college, and in after-school jobs . . . All these things I'm going to consider now as pertinent parts of each person's approach to careering.

So take the first tan sheet that I've given you (with four boxes in it) and let each box now represent each of the four stages of career development. I call the first one Early Personal Development, the second Professional Preparation, the third Affiliational Exploring and the last Positional Enhancement. And my guess is that all of you will be represented in some of these boxes and some of you will be represented in all of them.

Let's take the Early Personal Development box. Within this first stage personal development can be thought of as roles one plays in one's family, in public schools. It's a time of establishing identity; perhaps trying out different roles, exhibiting independence, maybe cutting off family ties, certainly beginning to explore the kinds of things that one does well and that one likes. Draw in, within that first box, a square or some geometric symbol to represent your family . . . in the left top part of that box, and write in, as I'm doing here, some roles that you might have played—whether you were the older daughter, the younger daughter, mother's helper, father's favorite, apple of your grandmother's eye, the responsible one—whatever it was. Try to figure writing that in. Also along the outside of that symbol make another larger symbol and write the larger family—was it close, did you have a favorite aunt, uncle, grandmother—and in the center part of the center square or circle (whatever you have drawn as an inner symbol) write your family's expectations of you and for you. Now make a series of symbols that will represent different schools, elementary, junior and senior high schools. Draw arrows from those symbols and write in the kinds of activities that you participated in. If you ran for office tell what office. Write it if you ran and didn't win it. The running is important. If you were in a debate team or a choir and that activity or club traveled, write down traveling as part of that. If you were an officer of your club or had some responsibility on your team, write that down too. Think of some describers or adjectives that are most appropriate to describe your feeling about each particular school that you were in or that describes your attitudes toward those schools or describes the way other people saw you.

Before we begin to share the information that you put down, again look back over your box of early personal development and I want you to compare some of your patterns to the families of some successful professionals whom I have studied. One pattern that emerges is that the families of successful people include their children in games and decisions so strategies and accountability are held for everyone equally. So if you played cards with your families, word games as a child, if you were in on decisions about vacations or financial decisions, write those kinds of things in. Write in the social skills that you're beginning to learn at this stage. Pay particular attention to the need for your own competent self-presentation, whether you took the lead in a play or were on the college radio, whether you spoke in a choral verse group, whatever it is that you did. Include also if it taught you how to look at people on particular projects. Note where you are highly visible and where your participation in athletics, newspaper reporting, student government, whatever that participation is, note that it requires group acceptance and group dynamics as well as the first trials of leadership.

Go to the second box now of Professional Preparation and for every college or university you have attended, make a separate oblong so that we can include as much information as possible. In the center of each write the name of the college or university and write what you think your goals were at the time and along the periphery of each, again write your activities. This time if you had any kind of

relationships with professors, research projects, other students, whoever that pertained to your life at that time, include that information. Draw spokes from it, make abbreviated language to represent the kind of things that were going on in your life at that time. Include also other people's opinions. For instance, if your family was against your studying engineering, write that opposition. If your boyfriend was also in engineering and was a support for you, include that.

Part of what we are doing at this time is beginning to elicit information that will show us the pattern of our own lives and the development of critical career competences that have been exhibited in the past. The point, and let me underscore point, is not to compare pasts to see whose was rich and whose was not rich (rich meaning laden with opportunity) but it is to use it as an indicator or as a map to what was and what now might be. This method of looking in the past is to isolate and underscore that which was helpful, beneficial, useful. And to allow us to see the progress that we have been making in this thing we're calling careering. Starting from the middle aisle, moving outward in each direction, two by two, beginning with the person sitting to the right going first and taking five minutes to describe to the person on the left the notations that you have made in the first two stages of your career, Early Personal Development and Professional Preparation. The person who is listening will provide the teller with what may be an unaccustomed experience . . . 5 minutes of totally uninterrupted attention. I'll tell you when five minutes is up. Begin.

Now reverse roles and the person to the left begin telling your version of your own life from these two boxes.

Good, thank you.

Let's move to the third Affiliational Exploring phase. Perhaps peculiar to lawyers is a scurry pattern of very fast movement among many law firms until one finds a position. Many lawyers report not knowing what to do at the end of law school and feeling green about opportunities and choices within the vast offering. In this stage, we're going to record the career paths that we have taken from college or from graduate school. In the large box begin to draw circles or squares or cornucopies—whatever symbol seems accurate—for the numbers of moves that you have made within an organization and between organizations. If you have also been active in the community, whatever you define as the community—whether it's civic or professional or church activities—include those as tangential symbols around this specific job with the organization that you have. If you have been teaching, include that. If you have also been studying, include that. If there have been mentors, important people, guides in your life, include them. You might want to draw a line outside of your job or draw a line connecting you back to a university if a professor was instrumental in moving you or introducing you to one style of work or organization or group of people. When you leave one organization for another, if that's what you do or have done, make some kind of abbreviated statement that tells the reason for leaving.

Now let's do the same kind of telling to each other as we did before. The person on the righthand side going first; taking again five minutes to tell the person to her left some of the moves of your careering.

And now reverse roles and the other tell.

The last box is Positional Enhancement phase. This is a wholly different phase of being. It's seen as influence itself rather than seeking influence and using others. This is a period of establishing yourself as a visible personage, as an expert in a community of communities. Your expertness will be exhibited in speaking and writing as well as being spoken and written about. It is the development of one's self as a role model for others. You'll notice public good works, volunteer work, civic groups, experimental groups abound, as well as work within your professional associations like this. You may see sponsorship and coaching of younger engineers in their development as part of being established, as having conviction, style and a specific field of knowledge. This may also be a time for taking stock; a recycling to a renewed personal development. In this box dare to think of yourself as successful and draw some symbolic figure that represents you in your position right now and begin to include the things that you do that enhance your position. (Repeat telling each other.)

Now let me talk about these critical competences and as I talk, take the second sheet of paper and begin to jot down in one column things that you already do and in another column the things that you would like either to develop in yourself or to teach others to develop, things you would like to improve in your own daily careering, and the things that you can offer as suggestions to others around you. Now these categories are really a first step. Think of them as a first step in identifying what can be thought of as part of the subject of the hidden curriculum for professional people. They've been included within the knowledge of group conventions and ability to confirm protocols as social competences. To speak euphemistically, the social graces have served as social elitist and exclusionary devices as well as for means of successfully handling interaction. You all know that family helps, mentors help, and, of course, the right schools serve as well to impart many somewhat undifferentiated skills and modes of being so that the artful use of a sub-set of what's called social competence to achieve career success is the kind of thing, again, that I'm trying to define. As women, this is particularly useful in comparing what is for women and what is for men, what is for successful professionals seeking to expand and enrich their careers and what is for those who seem to be either stuck or dissatisfied or in some way hampered by not being able to get in and to move up and around.

Each of these skills is identified by a label that describes two separate processes. The first is a kind of synergistic

demonstration of the second. Looking at your maps, you see that everything that you've done is in some kind of a verb form. Whether you've done risk taking, experiencing, or whether you've done moving I'm going to talk about these things as verbs; not that they're ever done but that they are in stages of completion—progress toward completion, not a completed state—so they are in their "ing" form. You can think of them as perhaps being sequential but don't let that limit you. Think of them rather as developmental from within.

Let's look at the first one: To Experience Doing. Now that's more than any one separate act. It's the combination of both to validate and be aware of the action. You can't do without experiencing the doing in a successful maneuver. So what that means is to recognize one's like or dislike of the doing. When you are acting, experimenting, or practicing, you create an occasion for exhibiting your skills that may not otherwise be available to be developed. You take what you have to start with and make something of it. So to experience doing then is a way of knowing and confirming and creating part of your identity. Now for women this produces a really serious question. Too many of us really have one or two experiences which we repeat over and over again, and that is experience as a support person. We are supportive to our family, to our husbands, to our supervisors, to our organizations—even in technical skills like engineering. Most of the time we are not in leadership positions and most of the time we limit ourselves from generating new ideas or following another kind of lead. Spend a great amount of time thinking about experiences, recalling them, and then creating them whether they are real or whether they are artificial, to have something to draw from, to create identity. Then it becomes as a competence, a question of what to leave behind as well as what to build on. To Experience Doing involves learning to negotiate, to feel comfortable with your own personal world of actions, reactions, and assessments, and new actions. Begin to list those things that you see yourself having evidenced. Look at your map from early on. See what the experience doing was. Write a phrase that captures that, draw an arrow on your column, and tell what skills, then, you exibited. Now it's not so easy. Let me take one example. We at Social Engineering have tried to do all of these things with each other, mapping out lives to validate or to come up with new kinds of theory from our own experiences as well as what we perceive. One of our experiences was telling each other successful experiences of doing in the past and one was "when I wrote a play in the seventh grade". I let that go as writing a play and demonstrating creativity. But when I was asked to write that whole scenario (or tell that whole scenario out loud) it became very apparent that that's not only what I did and that certainly was not the most important part, but that writing a play was a most convenient label. What I actually did was think about the project, write a jury play (a la Perry Mason) that was time-bound and would satisfy a notion of a plot. And I wrote it. I also cast the members of the class. I also directed the play. And I also led the discussion following the play and then tried to get everybody else to write plays and to do things and to have a series of jury plays that we might produce for the school. Now all of that exhibits many different skills and talents different from simply writing a play.

Make your list now, I'll give you some minutes to do that, and think about the consequences: what you learned from it, and all of the actions involved in your experiencing doing it.

The second Critical Career Competence is To Risk Linking which is more than risking or linking as separate acts. Taken together this skill becomes an initial assertion of being able to chance connections. These connections are made with ideas, styles, organizations, with family, as well as with individuals. Taken in the right spirit, this competence is rooted not so much in a gamble with explicit winning or losing as ends, but rather in an experiment.

In this perception life is more curious and more exploratory than it is determining correct answers. If you think of life as an experiment rather than a deterministic success or failure, you've so much more opportunity. Experiments, you see, carry with them an unexpectedness and a willingness to suspend judgment and a willingness, then, to go where new leads are, rather than to feel doomed by failing to reach that set out in some pre-notion of what was to be. Risk linking, then, is a skill at selecting what to risk where and to know what to expect where in order to successfully explore both concrete and abstract relationships. These experimental or tentitive connections are made in order to develop a skill of associating and of forming with others, of trying on styles of behaving, incorporating other ways of thinking and doing. From the practice of this skill, either receptivity in which to continue to build or else incongruence is experienced. Many people who I have interviewed and studied reported considering the connection as ways to test their own potential and suitability. Their willingness to leave situations or relationships without labeling that leaving as failure carries great significance for change within and between careers. There are many things to think of as you relate this particular skill of Risk Linking to yourselves; the myth is that women leave jobs often, they cannot balance both family and jobs, and that they're discontent workers. Now, you know that is only a myth. That, in fact, the reverse is true. If anything, women are more loyal than men employees and stay longer at each level than ambitious men. Perhaps one of the lessons is to put aside that craving for security or whatever it is, psychologically or sociologically that binds us to where we are, and try to do more Risk Linking.

Now look at your third box, Affiliational Exploring. This is where you'll see many examples (where you'll write more in that you probably have noticed). Look at that and try to extract times when you did this risk taking and connecting. Think of who influenced you. Think of when you learned to conduct yourself differently at meetings. Those are Risk Links. When you saw something, you were willing to change something, and you were influenced by the style of

others. Think of some group within your departments in which you changed one kind of working to another. Think of how you came into that group, whether you suggested it and gambled with it, or you were invited in but still you didn't know whether it would work out. Cite that as Risk Linking. Think of others outside of the organization in which you work, with whom you have any possible connection and recall how the connection was made, what your expectation for it was and what you made happen from it. For those of you who have changed careers, and I assume that many of you either didn't start out in engineering or got side tracked to one particular thing and then changed your mind and came to another kind of field or area, recall and then site what those changes were, where the risk was and where the linking was. Don't despair if you can't think of too many. You can look at it either way: either you're young yet and you haven't had many opportunities and we're going to build those opportunities in, or you didn't do it in the past and you can now opt to do it in the present and the future. Remember these maps and this kind of thinking is not to point up what's missing in the past or to point up whose past is better or the fact that yours wasn't as laden as you would like it to have been. Notions behind lifeplanning and career development as we use the terms, mean only to use these things as a guide – the past as a guide – so that you can make the future happen. Too many of us are aculturated to wait for things to happen, and instead we learn every time in our past when we have made things happen, they happen. To go from the responsive part (which so many of us have been aculturated to do) to the proactive part. Not just being active or being reactive; but probing for action, investigating it, instigating it, and experimenting with it, is a far more terrifying but exciting and vital way to live.

The third Critical Career Competence is To Show Belonging. To Show Belonging is to confirm affiliation to a group by the demonstration of belonging. So this competence is comprised of actions of the individual, of you, toward your group to assert membership. Belonging is an essential process that only begins with the initial invitation or the request or the acceptance of membership but membership within any organization must be maintained. Some of the successful lawyers whom I've studied report skillful demonstration of belonging by actions that are as seemingly unimpressive as simply non-threatening behavior to those who were in a wide range of behaviors all the way to the other side to those who are aggressive of protecting the group from the outside attacks. Of all of the skills that I'm going to mention today, showing belonging is the least visible or obvious but it is so essential that its absence becomes a serious afront which leads to negative action by the other members. Most of us, again as women, are aculturated to belong and we do many supportive actions that are interpersonal in nature. Think now, as you recall, write down ways that you have demonstrated showing belonging; of ways that you have actually enhanced the group. Think of the group as your individual unit, your entire department, or the entire organization or company for whom you work. Think of the things that you have done that have brought enhancement to that group, that have protected the group, that have validated the group. These may be as simple as attending company picnics, as belonging to different organizations or associations inside the company, or of protecting a colleague from attacks from hierarchies above. Another way to think about this kind of skill, To Show Belonging, is thinking of a lover, or a husband, or a good friend: what are the things that you actually do that demonstrate, that show your relationship with that person? Are there certain things that you do in public to demonstrate that? There are a lot of things that you do in private that demonstrate that, but that other one needs validation from you, needs protection from you, needs appreciation from you. It's not enough just for you to feel it. It's your showing it. Shakespeare said in one of his comedies that "she only loves who shows her love." Think of that in a sense of determining who a valuable colleague is and think of how that person shows his or her belonging to the organization; whether it's the lack of complaining, the lack of back-biting, or positive actions. Again, write down these actions that fall within this particular competence of showing belonging.

The next skill, To Exhibit Specializing, like the third one of showing belonging is a group skill. This one, To Exhibit Specializing, and exhibit was chosen very, very carefully, is to develop and display unique talents necessary to the group. This competence is one of developing and demonstrating one's individual ways of functioning or connecting by making them visible and available to the group. Both showing belonging and exhibiting specializing (both of them, the third and the fourth skills) involve demonstrated relational aspects between an individual and the group. The only difference is in focus. In the third one, in belonging, you seek to fit into the group to enhance the group, to maintain the relationship. In this fourth skill, in specializing, you capture the attention of the group and you fill a need of the group. Exhibiting is a harder one to examine and relate to than any other. We've been taught from childhood that exhibitism is wrong. In certain ways we, as a primarily female audience, know that exhibitism is even taboo. But it looks like many aspects of our aculturation have been wrong and detrimental to us and that valuable and successful engineers, lawyers, doctors, politicians learn to exhibit their unique specializing or particularizing in order also to become invaluable to the group. Think of what you do that fills your particular group's needs. Some of you will be the engineer's engineer, the one people come to, to think through a concept. Some of you will be the ones who get contracts from the outside because you have many connections. Some of you will be the ones people come to when they're depressed, when they have personal problems. Some of you will be the ones that people in your group come to because you have artistic or graphic talents. Some of you lead meetings exceptionally well. Some of you have task forces that seem to show more accomplishment than others. This is the trickiest and perhaps the hardest for all of us to think about for ourselves; so as you make your list, it seems slight to you. Think of this as a good opportunity to develop it. Take time now to complete your list.

The fifth skill, To Use Catapulting, involves two actions: the first is a linking of one individual or a group and within that connecting or linking the knowing, and trusting, and the maintaining of some relationship. The second part of the skill is your orbiting into a new world, a new idea, a new series of networks of connections that would not be there had not the first link been made. In careering, you can learn to link up with an important person who might serve as a mentor of some kind, maintaining a relationship with that person, and through that person's connections and world, have entree that would not be there before. Differing from a synergistic approach, it is not the relationship between the individual and the other but it is the movement in the other's world. Margaret Henning, who is Dean of the Management School at Simmons College for Women, reports that the existence of mentors in women's lives, particularly on into their thirties, is crucial for development of women. The buddy system among men has well been documented but it doesn't really exist very much for women because of the taboos that are around; the unknowns of male/female relationships, which in the past have always been overloaded with sexual overtures, with or without the implicit strings attached. Now most of you, in some sense, have really been pioneers in a traditionally male field. As women you represent only the smallest fraction of engineers so that most of your mentors will be with men. Most of you have already started that process and some of you are new yet to it. And it's a difficult one and it's probably one of the most rewarding ones that you can find. Studying organizations it looks as if no one can rise, can expand, can do anything that others must agree to, obviously without their agreement, if the careering ladder is a negotiable one. That is, if you move because you want to, there must also be the agreement on the other side from others who invite you up or who have to accept you up. There must be that acceptance, there must be that agreement. There must be that negotiation. Nobody can do it alone. That's one of the great myths that schooling has taught us which is antithetical to the way we behave in organizations and, in fact, in real life. Schooling teaches us to be independent, to know that there is only one right model, to sit, in fact, with our hands covering our papers (you've been taught with your left arm covering your papers so that you can't allow anybody else to see, or in essence, to cheat). In real life, notice, generally we work in teams, generally we share our answers, generally we know that there's no one right way but will pick a right way, and feel good about settling for that, and that we are cooperative, not only within our own organizations but between organizations, with some of the processes and the answers we've been coming up with. All of this has to be not only changed from schooling but relearned in a new adaptive mode. None of this is ever talked about and yet those of you who have had to give away credit for your work to the team when it may have been your first terrific gift to the organization, your first creative and talented generation, know the pain of giving it up. It's not that you must all the time but that you must sometimes for the good of the team show that kind of belonging. Our pain comes from the fact that we've never had that experience before. Schooling doesn't do it, we hardly see it in others, it's one of the invisible things and certainly as women it's hard to give things away when we originate them because of the too few examples in real everyday life of doing anything other than supporting others.

Think for a minute of the way you perceive, if you are married, your husband's careers and if you have children, your children's lives. Think of the complete planning that you assume on your part: what schools they should go to, what extra classes or activities they should take up; what friends they should have. Think of where you know your husband should move, should not move and as you think of these things you'll recognize that you really are a life-planner for their lives. What conferences like this are about are chances or time out to assess how you want to plan your own life. How you want to get in charge of your own career. When is a good time to move? When is a good time to enlarge? When is a good time to give credit? When is a good time to take credit? For those of us who have relatively little experience in knowing, from our own experience, that is, of knowing when to move and what to do we can rely a lot on other people's experience. A mentor can serve as a guide. A mentor can be powerful and invite. A mentor or any important person (you don't have to call that person a mentor) has that kind of experience that says "If you don't do it this way, these kinds of things will happen" or "don't present the new idea at the meeting, instead wait and talk to this other person who has great power. Give him the idea to suggest for you and together you and he can make something happen." "People as a group," he might tell you or she might tell you "in a meeting resist new ideas except from powerful people," so that you learn ways of moving and of dealing and of coping with the needs and pressures of group life that we have had absolutely no training for, except in our own experience of being in these groups. This workshop has been, in one sense, one chance to share the lore, as we've been calling it, of experience. It's not even asking people what they actually do, but asking what they would do over again, what they've learned from what they did. You all have had millions of experiences which you could recount as fact but when you're asked "how would you have done it differently?" all of a sudden the focus changes and out of that comes not what you failed at doing but instead what you learned. This learning hardly ever is shared. You could begin to initiate it after projects, asking for evaluation, asking the people who have worked with you to tell what they did that was good, and how they would do things differently. And pooling this kind of learning and appreciating it and validating it is really the stuff that we're about.

Using catapulting is one way to have access to those ideas and to have access to new kinds of connections and to have access to ways of being, expanded thinking and new, now possible actions that did not exist before. List, then, people who have catapulted you and think of yourself as the runner or the jumper on the pole vault, catapulted you to new worlds. Also think about what you have given in return. There needs to be in every relationship some quid

pro quo, some reciprocity. For those of you who have helped others, and I'm sure all of you have, you know that their appreciation is some of your reward, if not all of it, so that their appreciation has to be expressed. How then did you express appreciation for the people who have helped you? There's that funny line between being ripped off and feeling good about having given. And it has to do with the attitude and action of the one whom we're helping, or assisting, or giving to. Take time now to complete your list.

The sixth and last skill is To Magnify Accomplishing. Now To Magnify Accomplishing is the act of doing that which enlarges, expands, or broadcasts the group through our own action. It's a skill to get recognition of the group and of ourselves from the outside world apart from the organization. This enhancement getting is achieved by various maneuvers to publically acknowledge contributions. These contributions are valued by outside groups as participation through discovery or support. The getting of such notice carries with it a halo effect of glory or enhancement to the group as well as to us. This was one of the great surprises to me. I had thought that accomplishment was the noun form, the thing, the result of everything else that you did. Instead, I find that it is a skill that keeps getting completed but is never complete. Interviewing very successful people, I find that they are not now basking in their glory but they are probably working harder than ever and are seen as successful. Maybe not in order to be seen as successful. They speak nationally, they write nationally, they communicate through professional associations, they take protegees and become mentors themselves, they have a great visibility in communities through numbers of kinds of associations political, civic, philanthropic, religious, as well as professional associations. Take time to record on your sheet how you magnify your accomplishing. Now, let's go back over the skills and see how these relate to you and what you'd like to add now that you see what the scope of these critical career competences are. Now these are, I want to tell you, an initial or a formative theory. They're going to be refined and they're going to change, no doubt, and very probably I'll find other skills and add to them but at this time let's apply them as a grid to what we do.

None of these skills, as I said, is ever complete from what successful people's lives seems to indicate, therefore one goes back and forth developing these skills, from 1 to 3, from 2 to 4, from 3 to 6, and it looks like when one has gone all the way through 1 through 6, one is (or I am) very tempted to say that it looks cyclical. It looks as if successful people come back to To Experience Doing new things and Risk Linking new things so that one has never finished the experience of doing. Think of that which you would like to have experiences at and think of those experiences that you would like to see added to your life. Whether you want to have experience as being a leader, being a manager, experiences pitting yourself against danger (like going down rapids, mountain climbing). Think of those experiences that you yet want to add to your own repertoire, of what you do to add to your own identity. Many people in their late twenties and thirties need to experience how others see them, need to experience what they're doing and why it hurts or it gives them pain or produces some distress. Many of us have elected to experience therapy; any one of the therapies body therapy, mind therapy, religious therapy whatever it is. But we need that extra therapy and that extra exploration.

In the righthand column record some of the experiences that you want to cause to happen in a variety of fields, within your own career as an engineer. Some of you are in personnel, in that career. Some of you are trainers, in that career. As well as other life pursuits. Beside each experience that you want put somebody's name who is already interested in it too, who has already experienced it, or who may be willing to experience it with you. Get yourself a contact, somebody to try it with, somebody to report back to, or somebody who can give you information about how you go about getting information. Most of us, as human beings, need other people, need the support, need information from other people. Most do not go to libraries but most ask their friends. Those of us who want to try more and do more and experience more really need more friends than those who experience little. We have also selective friends. As we grow professionally, we understand that we have one group of friends who satisfies one need and another who satisfies another. And that we're not the same to all people and that, in fact, we have different faces and different roles. There is some research now that suggests the more different roles we play, the more different faces that you are free to put on, the more healthier we are the very essence of flexibility.

In skill number two, To Risk Linking, begin to record those risk linkings that you would yet like to have. Look at what you have started. Look at what you have already accomplished and begin to add "where do I need to pick up from where I left off?" "what is complimentary to what I have already done?" or "what is in a completely different direction that I also need?" "How can I observe how other people are at meetings?" "How can I find out other ways of thinking?" "How can I find out how others solve problems in the face of crises?" "How can I learn not to plunge into my work but instead take 5 or 10 minutes out to preplan how I'm going or to take a mid time to look at work on either end and say it's going the way I want it; do I need to follow the same path to its completion or do I need to change paths?"

Think of when you have left relationships or organizations or specific kinds of work and recall those experiences which were valuable for you and how long it took you to recognize that it was no longer valuable to continue doing it. It doesn't negate the value of the activity or of the relationship or of the process. If you see that you have never left anything, then perhaps at another time you can begin to probe what the reason for that is.

Come to the third, To Show Belonging, and look at what you have already listed as the ways in which you demonstrate or confirm affiliation. Think of other ways

that you see people whom you admire act or behave. I have a pet theory that says that we admire only those people who are enlargements of ourselves, so that we're really admiring either the germ of the idea that's in us or those traits which we already have. Similarly, we really dispise those who have traits which we have also, so build on those whom you admire and become more and more willing to take on their ways of acting in certain situations to try them out to see if they work for you. Think of other ways that you can demonstrate belonging.

Come to the fourth one, To Exhibit Specializing and look to see what you already wrote in that column, or you already do to exhibit specializing. Make a list now of some talents that you know you do have but you haven't included already under exhibit specializing. Think of ways that you can begin to display these talents. How can you be more visible? If we had a workshop to do just on numbers three and four, we could begin to get at the base of fear that holds us all back. It's not just fear, it's terror—of being visible to a group, of being seen, of being open to criticism (criticism that has happened in the past, that maybe in some situations repeats itself but at any rate plays over and over again in our head so that we come to know familiar damaging hopeless and helpless tape recordings that play and hold us back from the most appropriate kind of showing off (who we are and what we've learned).

And the fifth, To Use Catapulting: think of people or groups in addition to the ones that you have listed whom you know or that you have access to and write down what you can do in the next week when you return or the next couple of weeks to begin that relationship.

And the sixth one, To Magnify Accomplishing. In addition to those acts which you have written which enlarge or expand or even broadcast what you do within your group, think of other ways. Think of the business communication which used to be called the "house organ." Think of your company's newspaper. Think of some speech or workshop that you might give to your professional association such as SWE; there must be others wherever you are. Think of collaboration with other people to write up a special project that you've just worked on. Let me say one word about collaboration. It's sweet. It takes a great deal of time so that people get over their jealousies and get over their strong needs to get recognition, but it is worth the trouble.

These six Critical Career Competences can be performed for several different reasons at several different times, if not days, in our lives. They are performed because of our specific behavioral orientations. For example, we all need to get approval so we perform for our work group to support it by enhancing it or else by providing it with something it doesn't have. Approval-seeking is one of the best motivators even though it may not be what we'd wish to choose. Another is an order-making behavioral orientation that we demonstrate often. When we know the answers and can't stand messy indecision, we jump in to set things straight. It's often a positive healthy intervention, or it can serve our need to be the "knower." A third behavioral orientation is totally situation-responsive. In this mode, we approach life without determining set roles beforehand so that we can be free to see what's needed. Perhaps these get more sequentially developed as we gain more confidence in our abilities, as we test ourselves and find pleasing results, and as we are more willing to set aside those restrictive belief systems in order to create, to play, to progress—to career.

I want to thank you all for your participation, for your willingness to move through our career theories and practices, and for your essential support and sharing of your working lives. When I think of how hard it is for us as women professionals, I also think of a time perspective. Even ten years ago, we couldn't have been here like this. We are carving out new roles and dreams. When the ways in or up are not easy to find, remember that they haven't yet been defined. We are the pioneers!

Adele M. Scheele

Dr. Adele M. Scheele received her Ph.D. in Change Management and Adult Education from University of California at Los Angeles in 1976 and her M.S. and B.A. degrees from California State University, and the University of Pennsylvania, respectively.

Her varied career has included being a public school teacher, free lance photographer, college instructor, and labor negotiator. She is currently vice-president of Social Engineering Technology, Inc. Present activities include preparing public relations programs which are designed to alter the way in which services and products are seen and acted upon and preparing women to take charge of the psychological, social, and career aspects of their lives.

THE EXECUTIVE REVIEW

Elaine R. Pitts
Vice President, Corporate Relations
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While I haven't been able to be with you this week, I've tried to keep in touch by telephone and to talk with some of the speakers during the week. And, of course, I've had a chance to chat with at least a few of you since I've been here.

I'm particularly happy to be with you because I attended the first Henniker conference and look forward to a first-hand update. I must tell you that I find that some things don't change. For instance, I still flew in on a small plane, and rented a car and drove many miles to get here to be with you.

A number of other things have changed, however.

Before I came, I outlined thoughts which I wanted to share with you today. When I got here, I evaluated them in light of what I learned you had discussed during the week. And interestingly enough I find that we weren't too far apart. One reason for it is that everybody in this room is interested in upward mobility. If we weren't, we probably wouldn't be here. The words themselves have a very exciting, optimistic quality—a forward thrust.

This week you've had a chance to look at some of the opportunities that are opening up for women engineers and some of the personal and professional trade-offs that you face as you move ahead.

It's not my job, as you know, to give a factual wrap-up of what has been discussed. That's already been done. But I would like to review some of the areas you've explored and look at them from a practical trade-off standpoint—"what you have to give up for what you get".

More than once this week, you've discussed the two career tracks open to you—one, technical; the other, business.

If you choose to remain in a technical career track, the chances are that you may not be called upon to use as many management skills. Instead your emphasis may be on those qualifications, aptitudes, and interests that brought you into engineering in the first place. Such a choice might require the acquisition of a PE if you don't already have one; or you may require advanced degrees in your particular area of study. You have probably already identified what your competition is—other engineers in your own company, in your industry, and your own specialization.

A business career path, however, may represent a traumatic change and one which all engineers may not, on very serious consideration, be really interested in or prepared for. On this one, I'm speaking from personal experience because I chose or rather I was catapulted into the business side a number of years ago.

While I was in engineering, I was wholly absorbed in it . . . I loved what I was doing and, if asked, would have said that I would not consider leaving my chosen field. But life has a way of changing the way we feel—almost on a day to day basis.

A number of years ago, I came to the realization that the company I was working for was on a tremendous growth path, I was working as a packaging engineer for a non-technical company; in fact, I was the only engineer in the company.

While it was a very exciting, interesting job; a job that was going to last for many years; one which would probably never get dull; and one which I'd continue to be interested in; I recognized that it was going to stay at the same basic management and level of importance in the company. I recognized also that I really wasn't in the "mainstream" of the company. On the other hand, there were obviously opportunities for upward movement in the company.

I watched men in the company being offered new opportunities and changing careers. (Interestingly enough, management did not think, as a technical person, that I would be interested in changing careers.) And I began to question why I, too, couldn't move up. I realized that it would mean leaving a field where I had recognized competency, where I was comfortable and felt very much at home. But I decided, after some very serious thought, that I would let top management know that I was willing to leave engineering in order to move ahead.

Before I go on, I want to re-emphasize the fact that I went to management and informed them of my aspirations. Remember, I said that as an engineer they thought of me as a technical person with a particular expertise. My strong involvement and enthusiasm for my profession made them think I was not interested in leaving the field of packaging, so I let them know I was interested in at least exploring possibilities.

Keep in mind that it may be easy for you to get your first job as a woman engineer, but the second and the third steps in your career may not be as easy. It's extremely important, therefore, that your management knows that you are serious about your career; that you are willing to work hard to move ahead; that you ask no quarter; that you expect and want to carry your full share of the load. Keep in mind that every company has its own lifestyle and it's important

to learn what the lifestyle is, to learn to live within it; and most importantly, to learn to communicate within it. You'll want to communicate information on the job that you have done, and also on what your future aspirations are.

It's true that many companies have job evaluation programs. Some of them are good; some of them are mediocre; some companies have none. Personnel departments, too, are more sophisticated today in identifying career paths for their employees. But the fact remains that hard work alone is not necessarily going to get you to your career goal. You have to speak up and tell people what your ambitions and your interests are. You can't sit back and expect to be discovered. It may not happen.

While we're on the subject of communications, let me insert what I call a Pitts' Practical Principle, a word of caution about overcommunication. One of the myths that still exists in many men's minds is that women talk too much, so it's important to get the reputation of being a person who listens and thinks, and when you communicate, having something significant to say. At the same time, you are learning by listening; you can observe other people's strategies; and then apply them yourself. So watch your communications and don't overcommunicate.

Many of us have informal sets of rules about our future. The one which I espoused many years ago was not to stay with any one company more than five years unless I was growing on the job. Some of the younger engineers in the audience today may think five years is too long, but in my early career days, five years was a very acceptable norm.

You recall that I mentioned that I made my decision to move into a business track after serious thought. That was my particular inventory time. I had come to a very serious fork in the road, one which possibly involved walking away from my field of competence and moving into a whole new world. When you come to a point like that, you have no choice but to sit down and focus on your qualifications to see how they can best be channeled to satisfy your ambitions and to assure yourself that you're on the right career path.

One of the best ways to do this, of course, is to take pen and paper in hand and take a personal and professional inventory. Put down what your personal strengths are; list your professional qualifications as well as those qualifications which are transferrable to another job or another field. If you are stalemated within your company, you may have to face the fact that you will have to make a move elsewhere. But it's better to face that fact than get into a complacent rut.

I brought along a sample of a manual which is fresh off the press which will help you take such an inventory. It's called "Resume Preparation Manual". It was developed by Catalyst with a grant from The Sperry and Hutchinson Company as part of our affirmative action program, and our interest in helping women use their full potential.

This resume manual, which is available through both The Sperry and Hutchinson Company and Catalyst, will help you think through what you want to do; identify what your qualifications are—not only those which you have gained through education and work experience, but also those gained through life experience. There's a section on determining your job target; a section on developing your personal biography; one which lists a number of competencies on which you rate yourself; a section which helps you analyze your achievements. The manual will help you be flexible, to reach out, go beyond your present thinking. Finally, it will help you package your resume in a saleable form.

Recently, a Vice President of NBC, who incidentally is a woman, was talking about long range planning—the setting of personal goals. She advocates a 2, 5, 10 year plan. The plan calls for you to look ahead and determine where you would like to be in ten years. You then determine where you must be in five years to achieve that goal. You review your plan every two years to see how far along you are toward your five and ten year goals, and make any necessary adjustments in your timetable or your direction.

Basically that's what I've done during my work life. I set some goals, took regular inventory, and although I didn't set a specific timetable, when I came to a major crossroads, I decided to take a chance on moving into a business career track, told management how I felt, and made the change. And as I look back I realize it was the right decision for me.

Since moving into this new area, I've discovered a lot of "if I knew then's", which I want to share with you.

First, I didn't realize that it was like stepping back in order to step forward. That's always a possibility if you're going to make a change into an area which is completely new to you. You may have to take a lateral transfer; you may have to stay at the same salary level for awhile; you may even have to step back if it looks like your new career track is going to lead to much greater things in the long run.

You also may move from expert to neophyte. For instance, I moved into an area which I knew very little about. I, of course, did what we all would do under the circumstances, I started trying to acquire knowledge as fast as I could through courses, seminars, and consultation. It was a new experience for me to find myself asking for help, instead of serving as a consultant. It was an interesting ego experience—a maturing one.

It took me several years to move the next two levels in management. And eleven years to get my vice presidency. But I was learning all the way, and when each promotion came, I was prepared for it; much more so than I would have been if they had handed them to me because the time was right "to have a woman in that job".

When my last promotion came, it was to a full vice presidency – rather than the customary assistant vice president. Additionally, I was given the responsibility for the functions of Government Relations and Public Relations in a company that has very sensitive problems in both of these areas.

Another thing that I didn't realize at the time I changed fields was that the professional associations to which I belonged and the resulting professional friendships I had formed over the years were no longer relevant. As a result, I immediately joined professional organizations which related to my new job. These new organizations gave me the same kind of support, the same kind of help, as my previous memberships and I was once again in a very supportive environment where I could explore new ideas in my new field. This helped build my confidence, led to personal development and growth and ultimately led me to leadership roles within the new groups.

Another "if I had known then" was that I found myself in a people-oriented position rather than a project-oriented position. To move into management, you have to like people, to have extreme tolerance, infinite patience and to get your satisfaction from the accomplishments of others rather than as a result of your personal efforts.

I thought that I'd always known how to delegate, but there's a difference between delegating and letting go. I found I needed to let those people who worked for me use all their competence. One thing that follows this, however, and one I didn't anticipate is that as your people develop, they, to, are subject to promotion and you find yourself starting all over again.

I'm now in a job where I find myself spending considerable time advising and counselling people who work for me; where my time is not my own as I must be continuously responsive to their needs – while at the same time, seeing that their efforts complement one another rather than overlap, and that they all come together to accomplish both individual department goals and overall corporate objectives.

One of the most exciting parts of the whole transition – and one that I really didn't foresee – was that I increasingly found myself in a position where I could help other women. For instance, as we developed our consumer programs, we hired a professional field staff of extremely competent women.

This served several purposes. One, these women performed an important function for the company. Second, it gave them an opportunity to work independently and creatively in a given geographic area, which gave them tremendous job satisfaction. And third, this field staff's consistent, professional performance helped the company recognize that competency was not indeed restricted to men.

When I received my vice presidency, I attributed part of the credit to the other women in the company because they had all contributed to the increased respect for women's abilities.

Today, I have five directors reporting to me – two of whom are women. One of them – our Director of Civic Affairs – is also the company's affirmative action officer. She is attached to my staff rather than to the personnel department which gives her independence in her role of overseeing the company's affirmative action efforts.

We believe this function needs independence because frequently, whether justified or not, employees' complaints are against the personnel department. Therefore, it's important to have an independent arbitrator or mediator who can listen to such employees; put the problem in perspective; thereby helping the company work towards its affirmative action goals.

I also had the privilege and pleasure several years ago of assisting the chairman of the board as we searched for the first woman on our Board of Directors – Dr. Mary Bunting, former President of Radcliffe College, who has herself been a strong supporter of women.

Today, the "club" system, indeed, still exists in large corporations. It may not be the only route to success, but frequently if there are five candidates for the job, the person who gets the job may be the one who has somebody's hand on their shoulder.

I strongly believe that as women move up into the "club" (and it's happening) that they, too, have a responsibility to keep a sharp eye out behind and put their hand on the shoulders of those women who merit their support.

Let me close by telling you what I think may have been the one thing that has helped me the most during my long career life and that is my sense of humor, the ability to laugh at myself, to get outside myself and look at me, particularly when I'm taking life very seriously! A number of years ago I had a woman working for me who, when something really tickled her or seemed ludicrous, had a great way of saying, "Are you kidding?" Today, I still find that when I'm taking things too seriously, when life is rough, when I wonder what I'm doing where I am, or when I'm completely frustrated, I just step outside of myself and I say in Marie's tone of voice, "Are you kidding?" Then I laugh, come back to norm, re-assess things and move positively ahead.

Elaine R. Pitts

After studying engineering at the Illinois Institute of Technology, Elaine Pitts started her career with the Sperry and Hutchinson Company in Chicago as a packaging engineer. She developed the first packaging and materials handling systems for the company with merchandise being moved safely, economically and quickly from manufacturer, through warehousing, to redemption centers, and consumers.

From this position, Elaine moved to corporate headquarters and eventually became the first woman vice president of the company. In her present position as vice president of corporate relations, she is responsible for all areas of communications, public relations, government relations, and consumer and civic affairs for the total corporation which includes furniture, promotional, and consumer divisions.

She is a senior member of the Society of Women Engineers, a fellow member of the Society of Packaging and Handling Engineers, past national president of the American Women of Radio and Television, and an accredited member of the Public Relations Society of America.

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Dr. Adele Scheele (standing), Speaker and workship discussion leader with participants during workshop

Eileen Duignan-Woods (standing) with evening workshop participants

SUMMARIZATION OF WORKSHOP OUTPUTS

Aileen Cavanagh
Elizabeth I. Plunkett

Workshops were planned for Monday, Tuesday, and Wednesday evenings to acquire information from the conferees and to provide a means for them to share information among themselves. There were a total of six discussion groups each night. Members were rotated, and leaders were rotated in order to change group composition and leadership each night. This led to a total of eighteen different groups, who discussed the issues before the conference and sought to answer the conference questions. The conferees were provided with a number of informative readings as well as the morning panels, all of which served to stimulate discussion.

The first question addressed was "What is Upward Mobility?" A number of conferees were uncertain about consideration of top positions, feeling that was an unrealizable goal; the appropriateness of the group concentration on the top was soon confirmed by the fact that, for most, the top remains the goal on which their aspirations are targeted. Thus, means for achieving Upward Mobility to the top was the focus, but with respect and tolerance for those who chose to limit their own personal aspirations to positions achieved along the way.

The discussion about the definition of the topic led to a consensus that Upward Mobility is some orderly progression from doing routine work to holding a position characterized by power, influence, and responsibility, all appropriately compensated. While individuals each ordered the steps in this dynamic progression slightly differently, the group derived pattern is shown on Figure 1. It shows a progression from growing responsibility through status/recognition/prestige to influence and on to power. Money, perceived as appropriate compensation, was generally seen as a step taken at the outset or before the onset of influence. That is, a satisfier and not a motivator. Clearly then, those wishing to open paths for Upward Mobility for engineers, women, or women who are engineers must provide increasing work-related responsibility to them, accord them the status of recognition, encourage the expansion of their influence, and confirm their authority with appropriate position power.

Concern may exist about whether these signs of their progress are things the conferees wish to have for their own use (extractive) or use for the benefit of their peers, customers, or employers (contributive). Figure 2 shows whether each point was considered to be extractive or contributive by the group as a whole. Again, individuals evaluated each element differently.

The raw data contributing to both Figures 1 and 2 was derived from a questionnaire shown in Figure 3. Women were in the majority in the group, and no data are available by which to differentiate male and female opinion. Note that power comes out weakly extractive, while responsibility comes out weakly contributive. This point is worth further exploration, and research is being designed to explore it among working engineers and managers of both sexes and all levels of responsibility and power.

It was not possible to deeply analyze the output of the workshop discussions. The interrelationships among the various discussion points are complex, and it seemed most productive to simply organize the output under a number of topical classifications, each directed to a different policy unit, and publish the list in its full complexity. The topical classifications and the policy units to which they are most appropriately addressed are:

1. **Discrimination Patterns the Conference Feels Exist**
   Addressed to: Employers, Government Law Enforcement Agencies, Human Rights Interest Groups, and the Engineering Profession, for Action.

2. **Discriminatory Processes and Mechanism Identified**
   Addressed to: Employers, Government Law Enforcement Agencies, Human Rights Interest Groups, and members of the Engineering Profession, for Action.

3. **Institutional Recommendations**
   Addressed to: Employers, Affirmative Action Consultants, for Action. Government Law Enforcement Agencies, Human Rights Interest Groups, and members of the Engineering Profession, for Information.

4. **Managerial Skills and Knowledge Needed in Addition to Engineering Education and Experience**
   Addressed to: Employers, Schools of Engineering, Schools of Business, and Curriculum and Course Developers for Management Training programs whether degree granting or not, for Action. Affirmative Action Consultants, Government Law Enforcement Agencies, and members of the Engineering Profession, for Information.

FIGURE 1

THE DYNAMIC PROGRESSION

POSITION	ITEM	MEAN RANK	RMS DEVIATION**
1	Growing Responsibility	2.28	1.28
2	Money	2.75	1.53
3	Status/Recognition/Prestige	2.79	1.26
4	Influence	3.18 - 3.62*	1.17 - 1.32
5	Power	4.10	1.13

* Two respondents placed Influence in both positions 4 and 5. 3.18 is the Mean Rank with their data removed, 3.62 is the Mean Rank with their data included. Both respondents eliminated power from their rankings.

** Root Mean Square Deviation

Spearman Correlation Coefficient: 0.82
(Ranking, correlation between participants)

FIGURE 2

EXTRACTIVE OR CONTRIBUTIVE

ITEM	TOTAL POINTS	EXTRATIVE POINTS	CONTRIBUTIVE POINTS	CLASS AND % FOR CLASS
Growing Responsibility	80	36	44	55% Contributive
Money	80	70	10	88% Extractive
Status/Recognition/Prestige	78	51	27	65% Extractive
Influence	78	24	54	69% Contributive
Power	78	41	37	53% Extractive

FIGURE 3

ENGINEERING FOUNDATION CONFERENCE – UPWARD MOBILITY

I. CAREER ROUTES OR PATHS IDENTIFIED (LADDERS)

1. Highly Technical
2. Project and Technical
3. Functional Technical Management and Administration
4. Managerial

II. DEFINITIONS OF UPWARD MOBILITY

1. Dynamic progress from achieving money to status to influence.
2. Power in action.
3. Achievement of recognition in leadership role.
4. Moving up (up = with success measured by others) in terms of power, money, prestige.
5. Responsibility.

CONSENSUS QUESTIONNAIRE

1. How would you order the dynamic cycle in time, using the following words: - 1 is first, 5 is last.[1] Please check the appropriate box (this gives a map)

	(1)	(2)	(3)	(4)	(5)
Money					
Power	—	—	—	—	—
Influence	—	—	—	—	—
Status/Recognition/Prestige	—	—	—	—	—
Growing Responsibility	—	—	—	—	—
	—	—	—	—	—

2. Classify each of the thoughts as an extractive benefit, a contributive benefit, or a combination.[2]

	Extractive	Contributive	Both
Money			
Power	—	—	—
Influence	—	—	—
Status/Recognition/Prestige	—	—	—
Growing Responsibility	—	—	—
	—	—	—

[1] Participants were told that 1 was first in importance with time and 5 was ranked last in importance in time.
[2] See Appendix C.

5. **Long Range Strategies for Individual Initiative**
   Addressed to: Individuals with upward mobility aspirations, Action.

6. **Short Range Strategies for Individual Initiative**
   Addressed to: Individuals with upward mobility aspirations, Action.

7. **Deterrents to Aspiration for Upward Mobility**
   Addressed to: Those who seek to motivate people to aspire to Upward Mobility, Human Rights Interest Groups, Employers, Educators, for Action. All, for information.

8. **Real Deterrents to Promotion, Upward Progress**
   Addressed to: Employers, Government Law Enforcement Agencies, Human Rights Interest Groups, and individuals with upward mobility aspirations, for Action.

9. **Aids to Aspiration, Promotion**
   Addressed to: Those who seek to motivate people to aspire to Upward Mobility, Human Rights Interest Groups, Educators, Employers, and those who aspire to Upward Mobility, for Action.

10. **Problems Faced by Those seeking to motivate others to aspire to Upward Mobility, and by those who aspire to it, especially for Women**
    Addressed to: Employers, other women, Government Law Enforcement Agencies, Affirmative Action Consultants, Human Rights Interest Groups, the Engineering Profession and its individual members, Spouses, for Action.

11. **The Price of Success (Paid by Successful Achiever)**
    Addressed to: Educators, Spouses, Medical Profession, Sociologists, Behavioral Scientists, and aspirants, for Action.

12. **Costs and Benefits of Upward Mobility Policies (Borne by Employers)**
    Addressed to: Employers, for Action. Employees, for information.

13. **Career Paths**
    Addressed to: Employers, for Action.

14. **Success Factors**
    Addressed to: Upward Mobility Aspirants, for Action.

15. **The Mentor/Sponsor/Inside Track Issue**
    Addressed to: Employers, aspirants to Upward Mobility, and Affirmative Action Consultants, for Action. Government Law Enforcement Agencies, Human Rights Interest Groups, Sociologists, for Information.

Two myths were perpetuated in the workshops. One is an issue readily resolved by providing information of a factual nature to counter the myth. The myth is that means for acquiring training in lieu of experience for positions above middle management is not available; the facts are, of course, that Advanced Management Training Programs do exist, their graduates are in demand, admission is highly competitive, and they cost a lot. But women engineers have a high probability of success in them. They are not well known to the public at large, and tend to be used by an elite industrial and governmental group. Employers have sent men to these institutions for many years; women are not yet appearing in them on a regular basis.

The second myth was that the employer is responsible for the development of the individual. The facts are that employers develop individuals to suit employer needs, for the performance of tasks and responsibilities that pursue the employer's mission. An individual whose needs differ from those of an employer is responsible for problem recognition and definition, in his or her own behalf. The conferees did recognize this fact when the group reports were exchanged, and their recognition of the divided responsibility for the development of individuals into executives is demonstrated in the text of the Conference Resolution.

Finally, there are four notes to be recorded, each on a different topic.

1. Many Corporate representatives present at this Conference were staff people, and lacked the power to alter corporate policy or to initiate change on the promotional line. This fact was noted by many of the very high level line personnel present as well as by other attendees. The sense was that corporations *should* have sent an Executive or Engineering Vice President, or a representative of that level.

2. The consensus developed that the issue was not the narrower one of selective advancement of women, but the broader one of the achievement of equity in the corporate as well as in the social environment.

3. Support of employees at any level as persons worthy of development to the point of achievement of their highest potential is *NOT* the equivalent to the protection of women from male dominance, or from the "dirty decisions of the business world.

4. Many women, some at very high levels, experienced support group discussions for the very first time at this Conference. Many observations were made about the timidity of both male and female participants to reveal their thinking at first, and their later positive expressions about their changing sense of values and their confirmation of a hitherto subdued (subliminated?) sense of self-worth. Perhaps this is indicative of a sense of isolation which is well identified as an executive characteristic. The male minority indicated they also experienced a changing sense of certainty about their values, experiencing for the first time the minority's sense of isolation when deprived of their own peer support group. Many of these men, most at high levels, had never before really heard the historical development of the professional "put down" the women had experienced in their developing careers. The conclusion from all this is that the attendees experienced an enrichment of significant proportions. Institutions who employ them will hopefully build on this foundation, since the potential for their development as leaders in achieving adult interactions in their own organizations is enormous.

The workshop leaders and the members of the Conference Committee all participated in a very rewarding de-briefing in which the draft of the Conference Resolution was written and edited, based on the outcome of the workshop discussions and the Conference formal program. This Resolution was introduced by Paula Loring, and after some minor modifications and a penetrating discussion, was passed unanimously by those present at the Friday morning wrap-up session.

We especially recognize the Designated Discussion Leaders (DDL's), who gave up part of their afternoon each day to prepare for their evening's work:

Emily Black (Briley, Wild & Assoc.)
Eileen Duignan-Woods (U.S. General Services Adm.)
Helen Grenga (Georgia Institute of Technology)
Arminta Harness (Westinghouse Hanford Company)
Barbara Johnson (Rockwell International)
Mary Malotke (Proctor & Gamble)
Mildred Paret (Bell Laboratories)

SUPPORTING INFORMATION

1. **Discrimination Patterns the Conference Members Feel Exist Today**

Age

Sex

Color

Marital Status/Family Status/Life Style

"Old Boy"/"School Tie"/Academic Discipline

Sexual Role Stereotyping

Inconsistency in Support (e.g., policies are permissive, do not encourage initiatives.)

Pressures of Traditional Values (e.g., unemployed means incompetent or lazy)

Protection of Women (misplaced)

2. **Discriminatory Processes and Mechanisms Identified**

Dead-ending by supervisory job assignment control, leading to technical obsolescence, limited responsibility, experience.

Temporary or special project assignments off the career line.

Holding patterns - short term work activity, delaying long term progression.

Training opportunities restricted to improving performance on the present job or preparation for the next job, rather than improving potential for future advancement.

Inconsistency in job assignments, in performance appraisal, and balancing responsibility and authority granted.

Workshop Directors and Discussion Leaders

Standing, left to right: Emily Brown, Adele Scheele, Paula Loring, Mildred Paret Eileen Duignan-Woods, Arminta Harness. Seated, left to right: Helen Grenga, Aileen Cavanagh, Barbara Johnson, Elizabeth Plunkett

Conference Committee Members

Left to right: Helen Grenga, Aileen Cavanagh, LeEarl Bryant, Paula Loring, Nancy Tafel, Elizabeth Plunkett

3. **Institutional Recommendations**

Provide or support developmental training for all levels of management. (Note: business aspects are not now covered as comprehensively as the technical aspects)

Provide or support developmental work experience at all levels of management. (Note: again, business aspects are not now covered as comprehensively as the technical aspects)

Provide challenging work assignments.

Provide mechanisms and communications channels to compensate for the lack of the grapevine inherent in the traditional "Old Boy" network. (Note: posting of open jobs is seen as one such mechanism)

Support personal development initiatives by encouraging them with reasonable but significant time and budgetary allocations.

Support mentors who are seeking to tap top talent. (Note: A mentor selects and supports a mentee; mentee does not select mentor)

Recognize the presence of continuing conflict between family and career responsibilities and allow for it at least in short term situations. That is, allow a time period long enough to actually resolve such problems, not just enough to decide what to do.

Provide equity in position power and in responsibility, as well as in compensation.

Develop fair expectations of performance and behavior.

Match capability and interest to job assignment progression and focus on talent rather than on age, sex, marital status, etc. in making job assignments.

Formulate appropriate institutional objectives, clarify them, and communicate them unambiguously to all concerned.

Take greater care in selection of lower level managers to improve the quality of coaching provided and the selection process implemented at the first level of managerial screening.

Recruit competent women for all levels of management.

Provide or support training for the understanding of legal aspects of business and engineering and for the development of accountability to the economic and social environment.

Separate performance review for merit raises from performance review for assessment of promotional readiness.

Inform all employees about recognized career ladders and cross-training benefits.

Provide consistency in support of employees.

Adopt a flexible mix of internally developed talent and enrichment from the introduction of new talent from the outside.

Take firm action to censure individual violators of corporate affirmative action policy in ways that clearly relate the censure to the affirmative action violation.

4. **Managerial Skills and Knowledge Needed in Addition to Engineering Education and Experience**

Learning skills – reading, observing, studying, inquiring.

Budgeting and Budget Control

Scheduling and Time Control

Understanding of Financial Concepts: profitability; financial management; reading and understanding financial statements; bankruptcy law and reorganization.

Development of self-energizing techniques and health and time management.

Professional partnership formation, Corporate formation, Unincorporated businesses.

Consequences of market changes; dealing with cost cutbacks; contract negotiation and cancellation; lay-off procedures and policies.

Labor law and precedents for management of collective bargaining employees.

Compensation practices, laws, policy; compensation program operation.

Assuming an authority role.

Planning processes; Decision processes; human behavioral processes.

Getting work done through others.

Organizational design.

Understanding legal aspects of accountability, of governmental regulatory checks and balances.

Motivational strategies.

Risk measurement and assessment (payoff, opportunity cost, probability distributions, etc.).

Development of awareness of bias and prejudgement.

Non-sexual interaction styles.

5. **Long Range Strategies for Individual Initiative**

Develop effective management style that suits manager and situation (How: observe other managers, study management texts, read periodicals about methods others have tried, discuss successful methods with friends in management).

Obtain appropriate training.

Acquire diversity in skills and knowledge.

Display skills at each opportunity.

Select an appropriate career path up available career ladders (Note: Upward mobility seen as more limited in technical ladder than in managerial one).

Plan a flexible path, review it frequently (Cycles: 6 months to 5 years).

Select appropriate family and community activities and assume leadership roles for experience and contribution.

Develop appropriate risk-taking competence and take appropriate risks.

Maintain professional society affiliations (strategy supports multiple objectives: information gathering, dissemination, social interaction, leadership development, and experience.)

Publish.

Maintain impeccable personal reputation: propriety, financial solvency, integrity, fairness.

Marry offspring of Corporate power figure (Is this facetious or a serious parallel to masculine tradition? Could be perceived as legalized prostitution.)

Learn to compensate for the missing supportive role of the "executive wife" which male executives depend on. (This strategy is unique for females, married or single, and for unmarried males).

Corollary Strategy: choose a supportive spouse with a strong sense of self, then learn to minimize spouse's difficulties in career-related social situations and during career-required separations.

Parallel Strategy: Learn to respect and behave sensitively to the influence and expectations of spouses of peers, bosses, and subordinates, whatever their sex.

Learn to identify, confront, and act on the compromises necessary to achieve dual objectives of life style and career.

Create challenges.

Preserve physical and mental health.

Start at the ground floor of new technologies if possible.

Remain constantly alert for changes due to new technologies, economic cycles, governmental pressures; prepare self to move to new emphases.

Remain constantly alert to changes in the distribution of power and influence in your own company, discipline, or industry. Identify "in" groups, "out" groups, and individuals "on the move". Be prepared to react to change, rely on your own judgement.

Develop a sense of timing.

Develop alternate plans for contingencies.

Maintain visibility and exposure to management levels two or more above current at all times.

6. **Short Range Strategies for Individual Initiative**

Target short range plans around the immediate environment.

Short range goals should be consistent with long range goals.

Short range goals should be achievable in the short run.

Accomplishment of goals should be measurable.

Short range (and long range) goals should be compatable with personal life priorities. (Note: short range objectives for women may depend very heavily on their current state in life—looking, engaged, newly married, parental years, divorced/widowed/single, etc. are all states leading to varied sequencing of priorities. The result is that the distribution of short range aspirations cross sectionally across any sample of women at a given time is very broad because of the diversity of life style which exists in a cross section of the population. Career dependency on life goals is also being more frequently observed among men.)

Change short range objectives or job to get around barriers to achievement of long range goals.

Actively seek responsibility (i.e. don't wait for it to drop in).

Actively seek out opportunities (i.e. don't wait for them to knock).

Apply for new positions consistent with long term goals when posted.

Exploit known age discrimination (Note: offered as a strategy for youth, accompanied by a warning not to exploit sex discrimination. This is, of course, both an ethical and a legal issue).

Seek visibility appropriate to long range goals.

Display appropriate risk taking behavior.

If stagnation sets in, seek a vitalizing move.

Position oneself to advantage.

Take advantage of a poor situation to display capability for turn-around and to display resiliency.

Identify the career ladders which are operating in your work environment.

Assume leadership roles.

Demonstrate initiative.

Choose companies and jobs that:
- Provide formal or informal training directed at advancement.
- Provide appropriate experience.
- Show clear ladders to the top for engineers.
- Have top executives that are engineers.

Accept mentor/sponsor assistance when offered.

Make forceful demands when appropriate.

Market your capabilities gracefully and creatively.

Increase your capability through training, and exhibit increased capability once achieved.

Develop realistic short range expectations for yourself and for others.

7. **Deterrents to Aspiration for Upward Mobility**

Mobility requirements.

Responsibility of the Chief Executive Officer.

Time commitments (i.e. long hours, deferred time off).

Fear of rejection.

Sexuality complications.

Security motivation, resistance to change.

Reaching middle management is a prerequisite to reaching advanced or upper management levels.

Competitive qualities are needed (Note: Do women prefer collaborative to competitive organizations?)

Technical over-specialization.

Institutional policy and practices.

Not enjoying work in chosen field of expertise (depression? apathy?)

Status of the profession in the eyes of the public, associates, and family.

Conscientious objection (Conflict between loyalty to organization and professional and personal integrity).

Public acceptance of engineering innovations (nuclear power, supersonic transport, etc.); incompatability between regulatory expectations and technologically achievable product at state of the art.

Holding back because in the minority position is a sense of representation not only of self, but of other women and women engineers as a class.

8. **Real Deterrents to Promotion, Upward Progress**

Mobility restrictions.

Time constraints of dual responsibility to career and family.

Visible chip-on-the-shoulder or rejected/hurt attitude (Note: seen as result of failure to meet expectations for self).

Unsavory personal reputation (sex, drink, debt).

Institutional policy and practice.

Visibly unhappy on the job.

Technical stagnation.

Technical over-specialization.

Emotional constraints of family reluctance to provide support.

Unfocused or unclear objectives.

Poor management.

Unreadiness to act, timidity in seeking or accepting responsibility or in taking the initiative.

Radical deviation from local norms of competence, behavior, appearance. (Note: seen as result of failure to meet expectations of others.)

Conscientious objection (Conflict between loyalty to employer and professional and personal integrity).

Security motivation, resistance to change.

9. **Aid to Aspiration, Promotion**

Increased sharing of family responsibilities by both spouses.

Achievement of technical and psychological preparedness and readiness.

Match between individual and corporate image (Note: question exists as to whether conformity or diversity is actually more vitalizing to the corporation. Aid to personal aspiration, promotion, not necessarily to corporate strength. Hence, individual but not institutional recommendation.)

10. **Problems Faced by Those Seeking to Motivate Others to Aspire to Upward Mobility, and by Those Who Aspire to It, Especially Upward Mobility for Women**

Getting others to listen.

Subduing visible emotion.

Broad distribution of preferences, hence poor agreement among women as a class (Note: results in random errors of very disturbing magnitude in any programs targeted to women as a single class, with assumptions of similarity in needs).

Finding prepared managers willing and able to develop women as managers.

Balancing family and career responsibilities.

Achieving policy status and getting rid of policy barriers to advancement.

11. **The Price of Success (Paid by Successful Achie ر)**

De-sexualization of professional associations and interaction leads to some social isolation.

Changing relationships with long-time friends.

Physiological and mental health.

Increased standard of expenditure from elevated status and life style leads to increase in cost of living to sustain new standards and life style.

Time for self and family is reduced.

Social contacts are constrained by the demands of the job.

Loss of personal independence.

Concessions with personal beliefs: diminished integrity.

12. **Costs and Benefits of Upward Mobility Policies (Borne by Employers)**

COSTS:

Some displacement of people due to outcome of widened competition for advancement within the organization.

Loss of talents of the losers in the vertical climb.

Conformity within the organization leads to a slow-down in vitalization and renewal when a promote-from-within policy is used exclusively.

Productivity or morale disturbance may occur as a cost of the diversity achieved through outside enrichment.

BENEFITS:

Expansion of resource supply for innovative talent, leads to economic growth, corporate revitalization.

Growth in achieving a social system characterized by adult interaction styles.

13. **Career Paths Identified**

Highly technical–professional resource, consultive. Competence.

Project and technical–project leadership combines technical and managerial tasks. Creativity.

Functional technical management and administration–regulation, operation, production, etc. Ongoing managerial effectiveness.

Managerial–responsibilities concentrate on planning, coordinating, integrating, and control.

14. **Success Factors Identified**

Competitive qualities.

Commitment.

Visible risk taking.

Decisive.

Confident. Courage of conviction. Self reliant.

Resilient.

Credibility.

Ability to fire if necessary, as well as hire.

Intangibles, such as luck, family contacts, availability at an opportune time.

Association with positive thinkers.

Communications capability, both up and down the organization and laterally with associates and peers.

Mobile/Adaptable/Flexible within the work environment.

Skill in delegation of tasks and freeing self to plan and to assume meaningful responsibility.

Reputation for competence, performance, fairness.

Acceptance of responsibility, accountability.

Supervisory credibility. Reputation of respect from subordinates.

Respect for dignity of others; sensitivity to embarrassment of others.

Reputation for getting the job done.

Organizing capability.

15. **The Mentor/Sponsor/Inside Track Issue**

This subject came up in most of the workshops and frequently in the Conference discussions. Some participants saw the mentor or sponsor as a positive aid to Upward Mobility, basing their perception on the prevalence of what was variously referred to as "the fast track", "the old boy network", or the "inside track". In each case, the advantages were in information received by the recipient of the special attention, and in perceived support whether that support was visibly translated into position power or not. The argument seemed to be that since this was the established tradition in the now prevailing masculine executive culture, the tradition and its benefits should be sought by, perhaps even demanded by women. Other discussants had contrary views, feeling that the favored position was a discriminatory situation in its own right, and that it perpetuated a form of unfair competition which increased the value of privilege and failed to increase the openness of opportunity to all who might qualify for advancement on more objective criteria of competence and capability. A third group perceived that for the present at least the mentor/sponsor would be a man and therefore women would be, in accepting this role, in the traditional subservient role in a sex-differentiated relationship. This group rejected the suggestion that women should seek these special advisors and advised that they instead learn to develop their own support system to achieve a separation between sex-differentiated social roles and their roles in business.

It would seem that as long as sex-differentiation is unavoidable, this will remain a highly personal preference among women. Some will seek and accept such special relationships; others will avoid and reject them. In many cases the woman's decision will be based on what she knows about the other individual and not on the strategic advantage or disadvantage the relationship imparts to her own career. The same woman may accept one such advisor and reject another, probably for essentially the same reasons a man would, with the additional complication of sex differentiation making the situation even more complex.

If we ever arrive at a point where sex-differentiation no longer dominates interpersonal relationships in business, the division may revert to the single issue of the desirability of continuing the tradition of special attention to favored persons rather than developing a new tradition of leadership selection based on performance and competence based traits.

In any event, those who seek and accept present masculine tradition put its benefits to the purposes of exchanging information and personal privilege. All conferees agreed that the ability to obtain and exchange information is both desirable and essential to personal advancement. The reluctance to endorse tradition surrounds the purpose of personal privilege: for some, the objection is a general objection of conscience; for others, it is a specific objection to conceding to a system which leaves the decisions about whether privilege should be granted, who should receive it, and the conditions of its exchange to men whose view of women remains sex-differentiated. That is, while information and personal privilege may be exchanged freely within the present tradition, power is neither shared nor exchanged but only granted by those who hold it now.

The Conference did not reach consensus on this topic. It did narrow the topic down in discussion so that these three viewpoints clearly emerged. However, it would not be correct to imply that the attendees were polarized into three groups; there is a great deal of overlap, and all possible combinations of the three positions exist, including observations that belief and behavior were not necessarily consistent among the many successful women present who believed the relationship to be undesirable but had in the past acted as mentors and active sponsors for others present in the discussion group. This insight, of course, helps to interpret the evident reluctance present in all members of this group to surrender power over their own careers to others; at the same time, it points out the strong generosity of spirit that has characterized those women who have succeeded in achieving their own career goals.

Aileen Cavanagh

Aileen Cavanagh received her A.B. degree in Physics from Boston University and she is now a Ph.D. candidate at the University of Massachusetts. She has twenty-five years of engineering experience ranging from development planning through operations evaluation. She has conducted research in the electrical properties of metals and polymers and served as a consultant for state government advanced technology programs. She is currently an instructor at the University of Massachusetts Business School and is a consultant on technical and innovational management techniques.

Aileen Cavanagh is a senior member of the Institute of Electrical and Electronic Engineers and a Past President of the Society of Women Engineers.

Elizabeth I. Plunkett

Elizabeth Plunkett is a Senior Program Engineer in the Noise Technology Staff of the Boeing Commercial Airplane Company. Her technical education is in Mechanical Engineering. She has studied at the University of Washington and UCLA as well as independently in the areas of engineering management and organization dynamics.

She is President of the Puget Sound Engineering Council (1974-1976), Senior Member of SWE, member of AIAA. She consults on career planning and originated a seminar designed to insure growth of women engineers in technical and management positions.

APPENDIX

Appendix A
Supplementary Workshop Material

To: Conferees, Engineering Foundation Conference; Upward Mobility [1]

Attached are some information sheets which present various theories and facts pertinent to our topic and some of the questions which we hope this conference will begin to answer.

Speakers have been invited to provide specific background information gleaned from their own research and experience in upward career mobility. The discussions during morning sessions and the discussions during the evening workshops will expand upon the conference theme. Informal afternoon conversations will provide opportunity for participants to explore points of interest or concern in greater depth.

We are asking you to spend some quiet time Sunday evening or Monday afternoon reflecting on the attached questions, and developing your own answers and notes for use as the conference progresses.

Please give suggestions for added questions or agenda requests to Pete Plunkett or Aileen Cavanagh. They will try to work your suggestions into the workshop and discussions for consideration by the conference.

Keep your conference notes with you so you can jot things down as you think of them. Spend a few quiet moments each day reviewing your "collection", and sharpening your responses in preparation for the Summary Workshops and the Friday morning consensus decisions on future action.

Economic Sectors in which Upward Mobility is Sought and Possible "Top Levels" on Various Paths

SECTOR	PATH	TOP JOB
Industry	General Management	
	Executive	Chief Executive Officer
	Policy	Board of Directors
	Technical and Innovation	
	Administrative	Technical V.P./Chief Engineer
		Director R & D
	Specialist	Corporate Consultant
	Other: Marketing	Division Director, Functional
	Production, Procurement	Vice President, etc.
	Public Relations, Personnel,	
	Finance (Investments),	
	Accounting, Planning, Control	
Government	Professional-Technical	
	Advisory	* Political Appointment or Civil Service
	Regulatory / R & D / Operations	General Schedule / GS 15 + / Requires congressional approval
	Electoral	Municipal Engineer, etc.
Academic	Education	Full Professor
	Administration	
	Educational/Curricular	Dean
	Support	Chancellor, President
Non-Profit	Research & Development	varies
	Administration	Executive Director
	Policy	Board of Directors
Military	Operations	General Officer Levels
	Staff	General Officer Levels

* Governmental "Top Jobs" are complex. Mixture of political and merit appointments. "Top Jobs" always executive nomination with legislative consent.

[1] This material and questionaire were used as vehicles to start conference participants thinking about various aspects of position evaluation and career planning.

THE CAREER LIFE CYCLE

EXTRACTIVE

1. Being educated and trained – basic skills – School.
2. Practicing what you have learned – gaining experience, earning money to finance own development.

CONTRIBUTIVE

3. Period of peak personal productivity and contribution.
4. Expanding influence through supervision of and development of others – early managerial experience.
5. Decision responsibility for work of others.
6. Providing for continuation by preparing others to take your place – educating others.
7. Retirement*

*What you make it!

ELEMENTS OF CAREER PATHS – OPTIONS

1. Technical specialization – includes all operating specialties as well as usual scientific/engineering. (e.g. Corrosion, process control, marketing, finance, etc.)
2. Executive – general management – integrates and coordinates work of the organization.
3. Policy – legislative, Board, etc. – formulates policy, but does not participate in execution.
4. Third Party Activities –
   a) Mediation
   b) Arbitration
   c) Judicial
   d) Regulatory
   e) Advisory
   f) Brokerage
   g) Sub-contract coordination

PATHING CRITERIA: CAREER PATH PLANNING

1. Skills and knowledge appropriate to career objective.
2. Recognized qualifying hurdles passed. (Degree, P.E., certification, etc.)
3. Formal education combined with informal education and life/work experience supports skill and knowledge inventory.
4. Flexible under usual path pressures.
5. Adaptable to internal *and* external change. (Planned *and* unplanned)
6. Goals, objectives well defined in broadest applicable terms.
7. Contingency plans for recognized goal/objective displacement probabilities.
8. Forward momentum maintained during rest periods, *or* plans for re-start energy at re-start points. (Financial and psychic resources *both* covered)
9. Planned self-development as a positioning strategy, reading, affiliations.
10. Strategic information flow maintained.
11. Collegial contacts maintained.
12. Distraction dissipated quickly *before* goal displacement occurs.
13. Resolve and commitment to planned objectives.
14. Realistic job progression and timing expectations.
15. Turning points identified.
16. Realistic emotional and personal risks for individuals concerned.
17. Realistic economic risks for organizations concerned.
18. Value assessment for innovation/creativity to employee at selected job objectives along planned path.
19. Realistic assessment of personal energies available to meet energy demands of career path along total path.
20. Realistic assessment of personal economic, physiological, and psychic condition along total career path.
21. Foreign language familiarization where appropriate.

MANAGERIAL SKILLS AND ACTIVITIES

Skills

Innovation
Policy formulation
Decision-making
Programming/planning/organizing work
Human organization
Budgeting
Motivating

Skills (Cont.)

Controlling

Persuasion

Language and Communication

Activities

All the above, plus functional breakdown:

Production

Procurement

Planning

Marketing–Sales, Inventory, Distribution

Accounting

Financial/Investment Planning and Management

Financial/Accounting Records and Budgeting Management

Public Relations

Engineering/R&D

Personnel–Recuitment, Selection, Development, Management, Compensation, Planning

WORKSHOP TOPICS [1]

I. The Concept of Upward Mobility

Monday, October 11, 1976

A. Complete questionnaire (for all conferees)

B. Resource material on "successes"

C. Patterns of career growth

D. Characteristics of the successful

II. Strategies for Upward Mobility and Professional Development

Tuesday, October 12, 1976

A. Choosing a technical path or a management path

B. Training, planning, implementing (investment for career growth)

C. Registration and unions in upward mobility and professional development

D. Professional Image

Reputation
Personal style, flair, "class"
How others see you

[1] Planned prior to conference. Changes were made on a daily basis as a result of the prior workshops.

III. Organizational and Societal Factors Related to Upward Mobility and Professional Development

Wednesday, October 13, 1976

A. Organizational characteristics that benefit growth and development

B. Upward mobility goal displacers

C. Performance factors and relationship to organizational promotion factors

D. Cost of success

QUESTIONS

Addressed by the Conference
(order is not significant)

1. What does *Upward Mobility* mean to you? Criteria: Money, influence, status, power?

2. Are your own goals targeted toward ultimately reaching:

   a) Technical specialization–recognized authority
   b) Executive responsibility
   c) Policy formulation responsibility
   d) Academic/Consultive responsibility
   e) Regulatory responsibility
   f) What?

3. What skills, knowledge, and capabilities are needed to become upward mobile on these paths?

   a) Technical specialization–recognized authority
   b) Executive responsibility
   c) Policy formulation responsibility
   d) Academic/Consultive responsibility
   e) Regulatory responsibility
   f) What?

4. What capabilities are needed to *remain* upward mobile on these paths?

   a) Technical specialization–recognized authority
   b) Executive responsibility
   c) Policy formulation responsibility
   d) Academic/Consultive responsibility
   e) Regulatory responsibility
   f) What?

5. What characteristics are attributed to females which you:

   a) Agree are uniquely female
   b) Do not agree are uniquely female

6. Are these any considerations applicable uniquely to engineers?

7. Are there any considerations applicable uniquely to *women* engineers? to male engineers?

8. Are there any considerations applicable uniquely to men? to women?

9. What impediments do you see to upward mobility for men? for women? for engineers?

10. How do you think people achieve upward mobility? What is the factual basis for your opinion or observation?

    a) Turning points
    b) Timing
    c) Opportunity
    d) Traits of successful executives *not* possessed by others
    e) Strategic planning
    f) Formal education
    g) Informal education and career patterns
    h) Career life cycle

11. The following are widely acknowledged as essential managerial skills. Which ones have you developed by education or experience, and what achievements can you claim in each?

    a) Innovation
    b) Policy formulation
    c) Decision-making
    d) Programming/planning
    e) Organizing
    f) Budgeting
    g) Motivating
    h) Controlling
    i) Persuasion

12. The following are widely acknowledged as essential managerial functions. Which ones are you educated for or experienced in, and what achievements can you claim in each?

    a) Production
    b) Procurement
    c) Planning
    d) Marketing, including sales and distribution
    e) Accounting
    f) Financial Management/Risk Evaluation/ Investment Planning and Management
    g) Public Relations
    h) Engineering/Research and Development

13. What organizational characteristics have you found or observed to exist at each promotional step or increase in work responsibility or influence? (i.e. What varieties of organizational design are "friendly" to women?)

14. How would the *professional* role be defined? How does this differ from *personal* self-image (role image)? Do successfully upward mobile people time-divide the personal and professional roles they assume?

15. What performance factors characterize successfully upward-mobile people? What relationship do these performance factors bear to promotional factors?

16. What factors seem to enable the transformation of aspiration into achievement?

17. What are the performance and promotion factors in your career history, and how do they relate to job-achievement factors?

18. What are the information factors on which successfully upward mobile people build their career? How do they get their information? How do they verify it? Use it? Is the grapevine a significant factor?

19. What are the pros and cons about supportive versus competitive behavior? Does helping others on your way up work better than competing with others on your way up?

20. Do you feel you are positioned for upward mobility now, or are there some basic items you need to develop first?

21. To what extent do you regularly engage in career planning and reassessment? Does the degree of this activity correlate in any way with your own success in achieving upward motion? Which strategies have succeeded? Failed? Diverted you?

22. Are there any patterns in the extractive or contributive goal sets that differentiate those who seek executive advancement from those seeking other paths?

23. What goal displacers have you experienced, and how have you gotten around them?

24. What extra-curricular activities seem important? Are there any overlaps?-

    a) For self re-creation
    b) For career path advancement

25. What conflicts of conscience inhibit your own behavior in seeking direct vertical promotion?

26. How do conflicts between loyalty and professional integrity influence your career pathing? Do successfully upward mobile people have any unique traits there?

27. Has your career followed the career life cycle? At what step are you now?

28. What are the relevant experiences with second and subsequent careers for those who have gone through the career life cycle more than once?

29. What is a realistic negotiating posture for getting commitments of support and an equitable compensation package at a job change?

30. What are the appropriate compensation ranges for different levels of managerial and technical responsibility?

31. What financial planning criteria are important in planning for upward mobility? How do these relate to negotiated compensation packages? What options exist to defer income to the future? To finance extraordinary career-building expenses in the present? How important is liquidity? Debt? Credit? Cash?

Appendix B

ENGINEERING AND MANAGEMENT
–With Emphasis on Women–

A Selected Bibliography
July 1973-July 1976

Joyce Holland Deegan
Manager, Technical Information Center
Collins Divisions, Rockwell International

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Appendix C

CAREER GOAL FORMULATION PROCESSES:

Contributive or Extractive?

Aileen Cavanagh
Management Consultant

Career planning is a process which starts with birth and continues throughout life.

Many words are in print about choosing a career, choosing a college major, and financing formal preparatory studies. Very little of value has been written on career planning in the mature years. All the evidence points to a deep individual and social need for career planning and reassessment as an ongoing individual lifetime activity. I would place this need in a position parallel to that of health, family, and nutritional planning. I feel the process itself is what needs to be communicated, with the content of individual career plans a matter for individual decision based on self-knowledge and an awareness of environmental influences.

The first question to be asked by an individual in the process is "why a career?" The answer should be evaluated against two criteria: wants and needs. Needs are defined as essential to survival. Wants are desires, which are not necessarily essential to survival. That is, needs are both necessary and sufficient, while wants are neither necessary nor sufficient. To most of us a job is an economic need, to many a social need, and to many a combination of economic and social needs. Each individual knows whether personal fears of failure well first from the mind or the purse. Economic needs are measurable in purchasing power, while social needs are measurable in harmonious human companionship (affinity and affiliation) and in self-respect. The levels of wants and needs are measured in these dimensions, with levels of wants set clearly differentiable from needs. Most people see a career first as a means to satisfy economic needs, and only later does recognition of the importance of social needs begin to emerge.

Thus, step one in the process is: ask yourself honestly why you work. Do you work to earn money? Do you work to meet people, hoping to make friends? Do you work to feel unashamed or proud of yourself? Put your answers down as the extractive requirements of your job. You may select one of these, or two, or all three. Try to quantify your answers in some way. I suggest converting earnings to purchasing power; friends desired to some idea of how many more you feel you can be close to - are you trying to find new friends in a strange area to which you have recently moved, or to fill gaps in your social life of a more specific nature? ; and self-respect to some measure of your feelings about yourself, choosing a measure of importance to you. Then classify each of these extractive requirements as a want or a need for your own economic and psychological survival and growth.

The next question to be asked by an individual in the process is "What kind of a job would fit me?". The answer here lies in the unique combination of skills, knowledge, and interests held by the individual. Jobs that take specific advantage of strengths and unique interests fit: is an electronics circuit designer qualified to design cams, gears, or a power plant? Is a psychiatrist qualified to perform abdominal surgery? Is a lawyer qualified to act as a judge?

Strengths and weaknesses can be evaluated against another set of dimensions. First, technical knowledge and skills; second, political or leadership skills; and third, coordinative skills.

Technical skills and knowledge can be learned through education or experience. They are generally specific in nature, and contain both a basic knowledge component and a set of techniques for using that knowledge. Technical skills and knowledge are not endowed, but rather introduced through education and practice. Some people may be better able to develop specific skills and acquire certain knowledge than others. A common observation is that those who excel at mathematics often place poorly in language studies: this is an observation which engineers tend to confirm, yet many outstanding engineers work exclusively in the international sphere and develop high language skills when there is a purpose involved.

Step two in this process is to inventory your technical skills and knowledge. A circuit designer, for example, knows Kirchhoff's Laws and knows how to use them. There may be a computer simulation program that helps the designer to optimize the circuits and balance the network of which they are a part more precisely and efficiently, but the program is useless to these designers unless they also have the skill and knowledge to use it, and how to evaluate its output. This is technical knowledge - - not because it is about electricity, but because it is rational, definable, and specific.

What is your own inventory of technical skills? By listing them you will begin to gain some insight into strengths you will bring to a job you can do, and what fields of knowledge you possess competence in. An important factor is how general or transferable the skill may be. Can your own knowledge of Kirchhoff's Laws be applied to the design of hydraulic circuits? How? Also, don't forget skills learned for pleasurable purposes - - can you drive a car? If so, you may be able to drive a bus, truck, or even learn to fly a plane? Can you tailor a coat? Sell an idea? What skills do your off-the-job community experiences develop? You are inventorying marketable skills. Once they are on your inventory, you then evaluate them by skill level, interest, and marketability, then decide which ones you choose to sell as your labor.

Political and leadership skills are important in working with other people and in developing your own awareness about environmental influences effecting your career. Some people say political and leadership skills are natural

endowments, given to some at birth but not to others. Others say leadership and political skills are both learned, and people can be taught to develop them. For career planning purposes, I think the basic question is not whether you have or can develop or acquire these skills; but whether if you possess them, you will want to apply them. Far too many professionals accept jobs in which they must be responsible to lead others, but do so either knowing they would prefer others to lead them, or knowing they would prefer to work independently without responsibility for interaction with or leadership of others. Leadership and political roles do not develop independence; rather they develop interdependence. People seem to seek supervisory and managerial positions assuming that the release from line authority will enhance their independence, and discover to their sorrow that all that is enhanced is their responsibliity. Also, possession of the required skills and knowledge does not guarantee presence of the propensity to apply it. Similarly, the propensity to try to lead, influence, or manipulate others does not always rest on the foundation of prerequisite skills and knowledge in the area of human behavior.

Knowing your own capabilities, then, is not enough. You must know, for each of these two dimensions (leadership and political skills) both what you can do and what you wish to do; that is, you must develop and exercise a private conscience.

A match occurs whenever you desire to do what you can do. Your greatest probability of success lies in a match. Should you be unable to accomplish what you would like to accomplish, or should you be indifferent or negative toward using a capability you possess, the probability of success in your own eyes is slim, even if you appear successful to others.

Many executives seen as highly successful by others are in fact failing to succeed in their own eyes, simply because they do not value their own accomplishments. Ultimately these executives fail because of lack of commitment to their jobs, and often they succumb to ills attributed to stress.

Other executives, failing to succeed in the eyes of others, are in fact achieving their own personal goals, despite the apparent failure to meet the job goals others have set for them. These executives tend to react to the threats of disapproval by becoming possessive of their jobs, ultimately becoming either obsolete or ineffective on the job.

Cordinative skills call for being able to link many parts of a task or organization together. Coordination embodies technical skills, knowledge, political and leadership skills, organizational skills, information processing and analytical skills, and communication skills. The effective coordinator releases the output multiplying synergistic energies within a work area or organization. Coordination occurs at several levels – in one's private life, in family life, in community life, in economic life, and in one's relations with others. Again, for career planning purposes, the question is less one of whether coordinative skills rise from a natural endowment or are developed through education or training, but, given the presence of the skills, does the possessor choose to use them?

The self-knowledge inventory thus grows from a simple list to a complex multi-dimensional matrix, answering two questions of conscience and purpose: *First:* "Do I have the skill and knowledge, and if so do I choose to use it?" *Second:* "Do I have the skill and knowledge, and if not do I choose to develop it?"

A person whose goal is to design bridges must ultimately recognize that a great deal of specific knowledge, both technical and aesthetic, is required before that task can be competently accomplished. The question is, does goal displacement occur when the accumulation of this knowledge diverts this person from the task or goal of designing bridges to that of acquiring knowledge? In career planning terms, the answer to this goal displacement question is necessarily "YES". If the goal is to design bridges, the acquisition of knowledge sufficient to that task is a means to that end, and not an end in itself. The phenomenon of academic over exposure among practicing professionals is a very real goal displacer. Goal displacement may occur as opportunity, and is not necessarily destructive of a career. It changes a career in an unplanned way. It is an uncontrolled, accidental, and often unrecognized event in career development and growth.

The same person may see the bridges to be designed as aesthetically exquisite complex structures: can these design jobs be accomplished by one person working alone through one lifetime? Or, to achieve the goal, must the skills of the designer encompass political, leadership, and coordinative components? Knowing, then, that all three of these components must be present and used in order to achieve the goal, does the goal persist, or does goal redefinition occur? Does this designer still seek to be the THE designer or to be ONE OF THE designers? Is the goal now to calculate the loads, or to direct and coordinate the work of the design team? Has a goal of engineering design been translated into a goal of development of proficiency in managerial activity? Goal redefinition may occur in response to rejection. It is not necessarily constructive if it is in response to destructive external pressures. It changes a career in a planned way, is controlled, and is a deliberate and recognized event in career development and growth.

Goal displacement occurs when the goal has not been changed, but the means for achieving it become a trap for one's energies: that is, when effort is focused on the means and not the end. Goal displacement wastes energies because it is an inefficient byproduct of an unmonitored career management process. It occurs without conscious intent, and is the subject of the common expression "fallen between the cracks". It leads to habitually passive behavior rather than to the more desirable, innovative, creative, and assertive behavior.

Goal redifinition, on the other hand, is a conscious process, occurring as the result of continuous reassessment of career plans. It recognizes that, as our lives and the lives of our employing institutions progress, we are exposed to many new experiences, sources of inspiration, and opportunities for growth or change not foreseen when we drafted our first career plans. We learn to understand our own strengths and weaknesses better. We find we prefer specialization to generalization, or vice versa. We learn to tolerate or overcome disappointment, grief, sorrow, and other disabling emotions. We assume new responsibilities, and we learn to reject firmly and with intelligent confidence those activities we may be asked to do that disturb our private consciences. We learn to see our own mistakes and to correct them openly. As we grow in this way, we are constantly redefining our goals. Goal redefinition merely formalizes the developmental process, and focuses our attention on our purpose.

Thus, goal displacement traps us in the outcome of past errors; goal redefinition releases us to future opportunity. Goal redefinition is a form of redemption!

There are those who suggest that continuous goal redefinition is psychologically destabilizing, and thus, is as unhappy an outcome as goal displacement. I think these people are in error. When goal redefinition occurs, it is a conscious process. It focuses on the future by correcting past targeting errors. The new goals are defined only after consideration of related consequences. Because of this, there is no real correlation between escapism, which does not consider consequences but merely abandons responsibility, and goal redefinition which considers consequences and transfers responsibility. Escapism is almost instinctive, certainly not conscious; and in the healthy personality, represents a temporary abandonment of future responsibility as an avoidance of repetition of outcomes of like responsibilities assumed in the past. In this difficult modern world, we are all tempted to resort to escapism many times each day. Most of us instinctively recognize escapism as an extreme form of goal displacement, but altogether too few have as yet learned to redirect the energies dissipated in dealing with frustration into the conscious processes of goal redefinition and planning for goal achievement which are fundamental to effective career management.

How can YOU tell if YOU have "fallen through the crack"? I suggest this simple test: sit down, alone, in your favorite chair, without radio or TV, and with pencil and paper at hand. Think for a few minutes, and then try to write for yourself a description of your own career goal. If at the end of 20 minutes, all you have produced is a statement of your economic goals or the top title you hope to hold, you have "fallen between the cracks" and become dependent on resources outside yourself to control your career. You have succeeded in defining what you can get from your job, the extractive requirements: the missing information is the contributive requirement — what you can give to it. What this in fact suggests, and I believe it to be so, is that both a career goal and a life goal must be couched in contributive terms. In the vernacular of linear programming, the objective function is contributive, the constraint functions are the extractive requirements. A sense of contribution is the basic human need on which every person's self-respect depends. Because of this, we see many people unable to achieve self-respect on the job turn their career into purely an economic resource, and devote their innovative and creative energies to activities pursued off-the-job in which their participation is contributive rather than extractive. This diversion of human energy form on-the-job to off-the-job interests is a psychologically healthy human behavior, but it is economically non-productive for employer and employee alike whenever it disturbs the economic or psychological balance between energies dedicated to income production and energies dedicated to volunteer activity.

The final variable is loyalty to an employer. To most people, loyalty is interpreted as absolute fidelity of an obedient sort. But loyalty is a much higher virtue than that. Inherent in the virtue of loyalty is honesty and integrity, as well as a high sense of responsibility. Career plans based on an expectation of absolute mutual loyalty, deomonstrated through continued employment by a single employer, are simply not realistic. Neither are career plans expressing an expectation of continuous growth over a full career in one area of specilization or in the continuing application of a single skill. The obligations of professionals include the education of themselves and others who will continue the development of the profession in future time: the obligation of providing for both growth and renewal. The highest loyalty would then be loyalty to a goal of social and economic contribution which is consistent with the individual private conscience. In this sense, loyalty is equivalent to professional responsibility. We all know that obedience has no part in that; the fidelity is to truth and to human service and to the future rather than to the past.

The modern trend, complete with pension plans and employer paid health insurances, seems to be to sacrifice private conscience and personal integrity for some sort of public conscience and collective economic security. We are made to feel we are expected to take an employer much as we take a spouse, "for better or for worse". But consider - is this a sensible norm? Of course it's not. In the first place the burden of fidelity is not reciprocal: no employer is bound by it. Secondly, and more importantly, jobs change, people change, and careers are expected to be progressively more contributive to changing markets rather than increasingly faithful attachments to stable or bygone markets. Our loyalties are to humanity, and not to individual employers or products.

National economic security, in fact international or human economic security, depends very much on the ability of private enterprise and governmental services to adapt rapidly and responsively to the ever changing needs of developing populations. Human labor is very much a part of that changing system: the system depends as much on what you can do for it as you depend on what it can do for you.

1.11

Just as in the marital union, success depends on continual reciprocating adaptation to changing needs of both partners, so human economic and social security depends on the the interactions between careers and the economy. In this sense, an organization demanding fidelity to its past is not a responsible citizen; the only fidelity that makes sense is conditioned on service to humanity in the future.

The following steps are those suggested in the Career Goal Formulation Process:

I. DEFINE YOUR CONTRIBUTIVE GOALS
   1. Inventory your skills and knowledge
      a. Separately define skills and knowledge needed to achieve contributive goals, extractive goals.
      b. Assess your political (interactive) skills
      c. Assess your leadership skills
      d. Assess your coordinative skills
      e. Assess your technical skills
   2. Assess your willingness to consciously apply each skill you identified (Examine your conscience and your won will or volition)
   3. Define your contributive goals (in a sense, what you plan to *give to* your world).
   4. Define skills and knowledge you need but presently lack, and determine how you can acquire them

II. DEFINE YOUR EXTRACTIVE REQUIREMENTS
   1. Calculate your purchasing power requirements minimum, needs; wants.
   2. Assess your affectional needs, and the economic and emotional responsibilities that fulfillment of these needs will entail; ditto, wants.
   3. Determine which of the skills you have or need to acquire and are willing to sell in the labor market has a market value (singly or in combination) sufficient to meet your minimum purchasing power needs; wants.
   4. Define your extractive goals (in a sense, what you plan to *get from* your world).

III. PLANNING
   1. Layout your career plan, using the present set of marketable skills from item II.3 to gain present present purchasing power, and planning for on and off-the-job development to acquire skills and knowledge you need to make the contributions you want your career to make. Select your time frame, and make timing a part of your plan.

IV. IMPLEMENTATION
   1. Find a job consistent with your plan. If this means a job change, then change.
   2. Reassess your position on each of these items at least at six month intervals FOR THE REST OF YOUR LIFE.
   3. Make changes *in your goals* whenever it becomes apparent that your interests and contributive hopes have changed.
   4. Make changes *in your plans* whenever changes are necessary to redirect your career toward consciously redefined goals, or to counteract goal displacement and return your path of progress to retained goals.
   5. Plan your current finances to develop a cushion against future unemployment. Do not borrow against future income or assets you want to retain for sentimental reasons. Do borrow against other current assets, with due regard to the risk entailed for the asset.
   6. Maintain continuous awareness of the job market and of your own economic environment through reading business and financial periodicals, the daily press, the want ads, and the periodical literature of the profession and your areas of interest in it.
   7. Discuss these points openly with family members they affect, and encourage other members of your family to make career goal formulation both a lifetime habit and an open topic of family concern.

I guess there is a last point to be made. Traditionally men have not expected very high career aspirations of women, and the problems which result from that miscalculation are evident all around us. But there is another tradition, equally damaging in my view: wives often expect a very different career performance from their husbands than the men would elect for themselves. As a traditional dependent, a wife often views her husband's career as a means which provides only economic resources to support the family and household. She often fails to consider her husband's own career contributive needs, or his needs to rebalance extractive and contributive energies for his own psychological well-being. In this sense, she is viewing his career as her means of support, and missing the point that two careers are involved in the sense that two sets of contributions exist even if there is only one extractive reward to balance the two different contributions to personal and family growth. Both sets of miscalculations – male expectations of his spouse's expectations, and female expectations of her spouse's expectations - result in too much extractive emphasis on career outcomes, leading to too little family life in some homes, and in others to too much debt pressure. The same prejudgements that led to the whole phenomenon of the underachieving female also lead to wifely demands for achievement beyond their own goals for males, and to male withdrawal and aggression as well as to femal withdrawal and aggression at home or at work.

While this exercise in career planning is designed to clarify career goals, it is true that because of family involvement, family planning is a very important input to career management. In a culture which places the family first before other obligations imbedded in the cultural structure, careers are functions of family goals. Only in cultures in which the family is subordinated to careers would it be true that family goals would be a function of careers. In this career management process, and to the extent that constant review of the individual careers in the family is occurring,

the opportunity is present to keep all the relevant factors on the table for open family discussion. I hope that those who choose to give the career planning process a try will recognize the career as only one element of their lives, and take advantage of the communications channels the planning process opens within their family lives.

Engineering is a laudable profession, and basic to human economic activity. Conscience, skill, knowledge, and market opportunity are all factors in career manipulation and control. Those who wish to enter engineering need special preparation. Many who enter the profession at one point in their lives may outgrow it at another. The way to avoid goal displacement and escapism is to deliberately and continuously perform career reassessment and to periodically entertain goal redefinition. Goals may require the acquisition of new skills and knowledge, or the application of skills and knowledge already possessed. Goals should never conflict with conscience. Monetary goals are valid and necessary (especially in the short run), but for most people are not primary or sufficient (especially in the long run). Monetary goals and achievements do not contribute to self-respect in the absence of contributive goals and achievements. Concentration on monetary goals to the exclusion of contributory goals is a form of goal displacement leading to employee dependency on employers, to absolute loyalties and other unhealthly alliances, and ultimately to disappointment, frustration, and escapism. Other extractive goals, such as human companionship and the exercise of manipulative skills, are also valid; but again, seem to be secondary to contributive goals when the goal achievement criterion is self-respect, sometimes called self-actualization.

This paper was originally prepared for limited distribution by the Society of Women Engineers during Engineer's Week programs in February 1976, and has since been used as a basis for workshop discussions in career planning and in career resolution between married couples seeking to balance two careers.

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Appendix D

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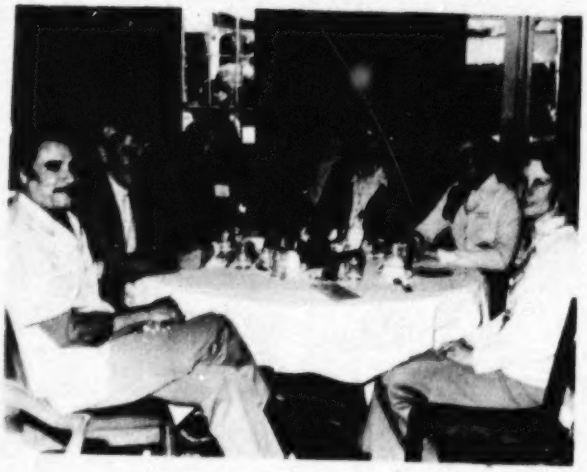
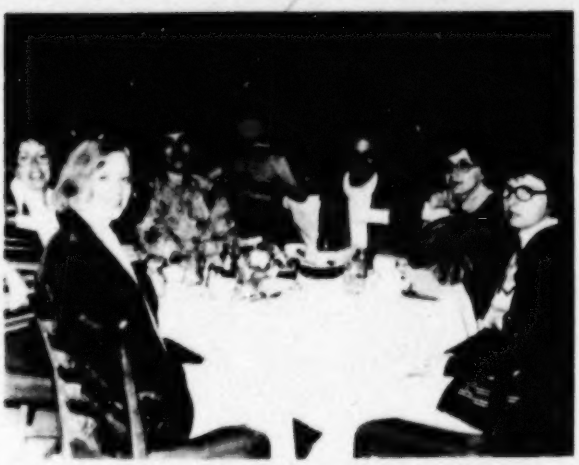


Participants at Lunch and Work



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Appendix E

RESUMES OF CONFERENCE COMMITTEE MEMBERS

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Aileen Cavanagh – See page 79

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Helen E. Grenga received her A.B. degree in chemistry from Shorter College, Rome, Georgia and her Ph.D. in chemistry from the University of Virginia.

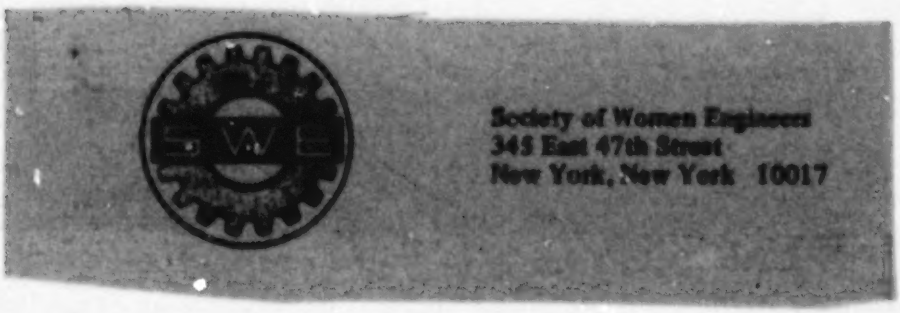
Her professional experience includes serving as laboratory instructor at the University of Virginia, chemist for the United States Food and Drug Administration and as assistant professor at Georgia Institute of Technology.

Dr. Grenga is currently Associate Professor in the chemistry department of Georgia Institute of Technology. Courses include general metallurgy, engineering materials, catalysis, surface science and technology laboratory, and extractive metallurgy. She is an active researcher in the metallurgy field and is the author of several publications in this field. She is active in several organizations relevant to her profession including the American Chemical Society, American Institute of Mining, Metallurgical and Petroleum Engineers, and Society of Women Engineers.

Elizabeth I. Plunkett – See page 79

Nancy L. Tafel

Nancy L. Tafel is currently Representative–Central Region, Professional Development Operation, General Electric Company. She received the B.A. degree in English and Humanities from the University of Louisville in 1948.

With General Electric since 1951, she was one of the first programmers of large scale computers used in commercial applications and spent nineteen years in computer programming, software development, application engineering, and management prior to her present position.

Miss Tafel is a member of ASEE, the Society of Women Engineers, and the Midwest College Placement Association. She is currently Chairperson of the ASEE-RWI Division's Women's Action Group, an elected member of the MCPA Assembly, and a member of the Board of Governors of the CIC+ Midwestern Program for Minorities in Engineering.